Musculoskeletal Block

Pathology of Musculoskeletal System

Practical Classes

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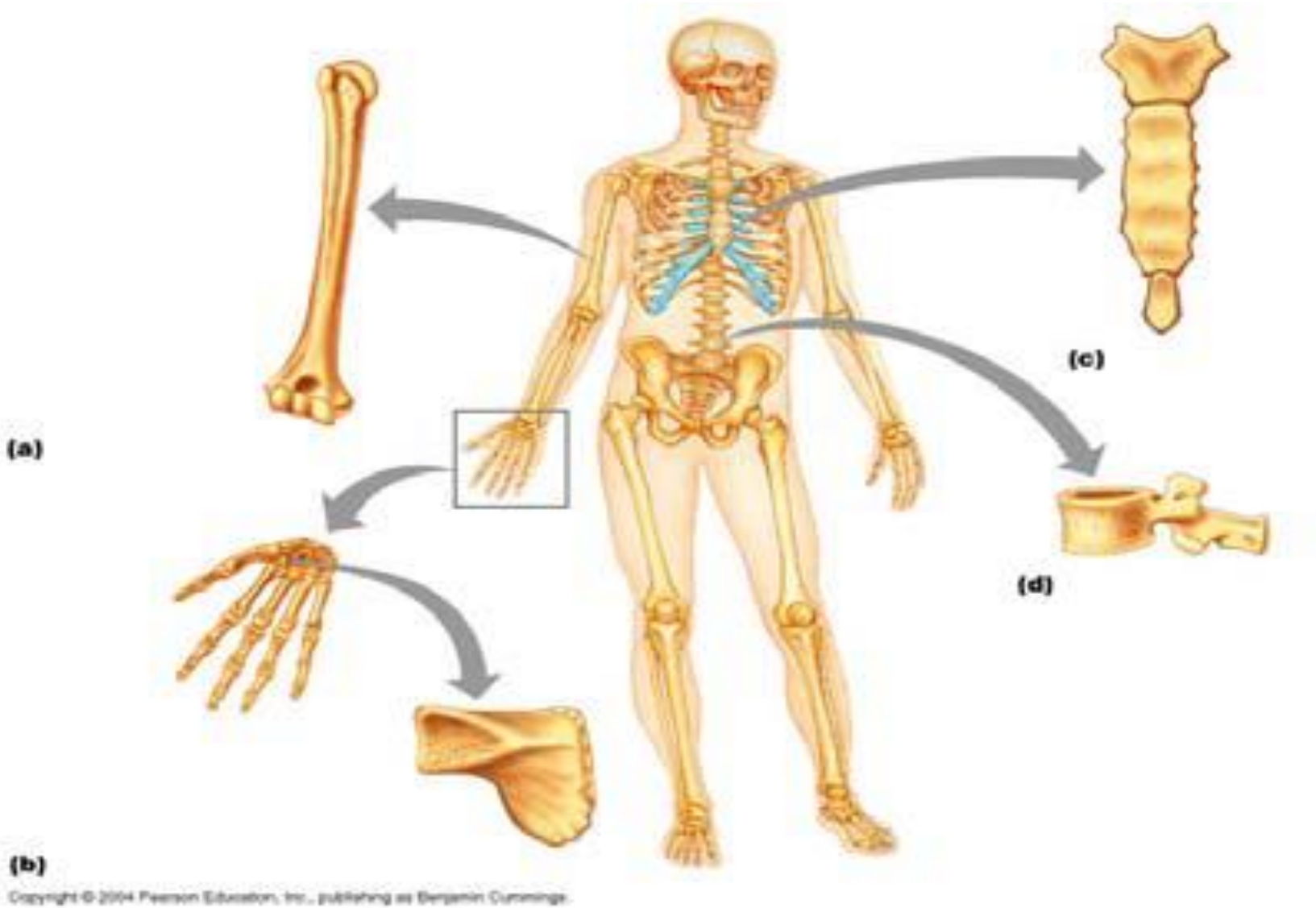
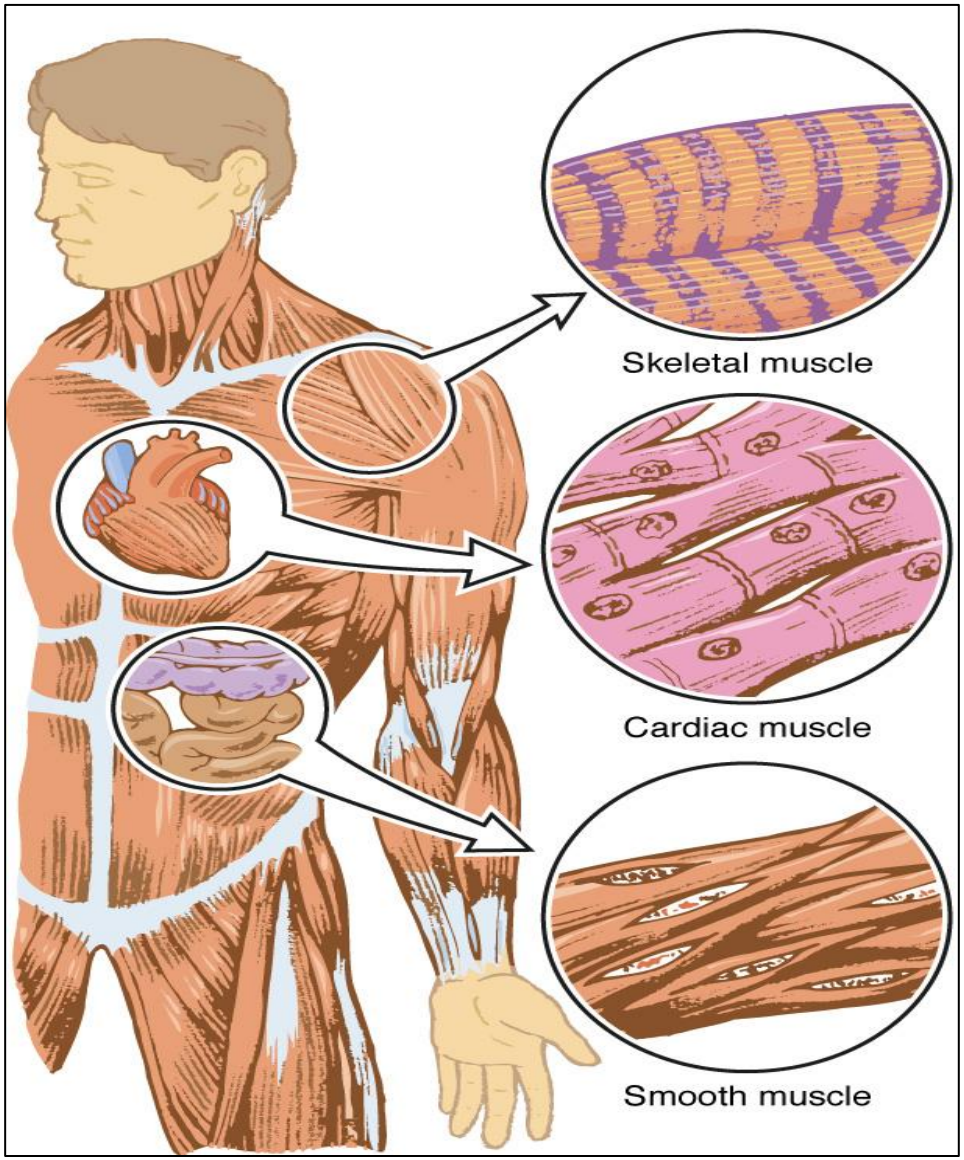
ANATOMY AND HISTOLOGY

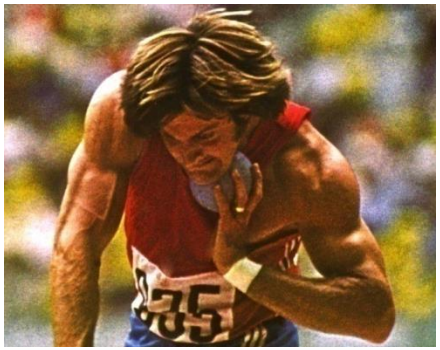
Body Skeleton



Types of muscles

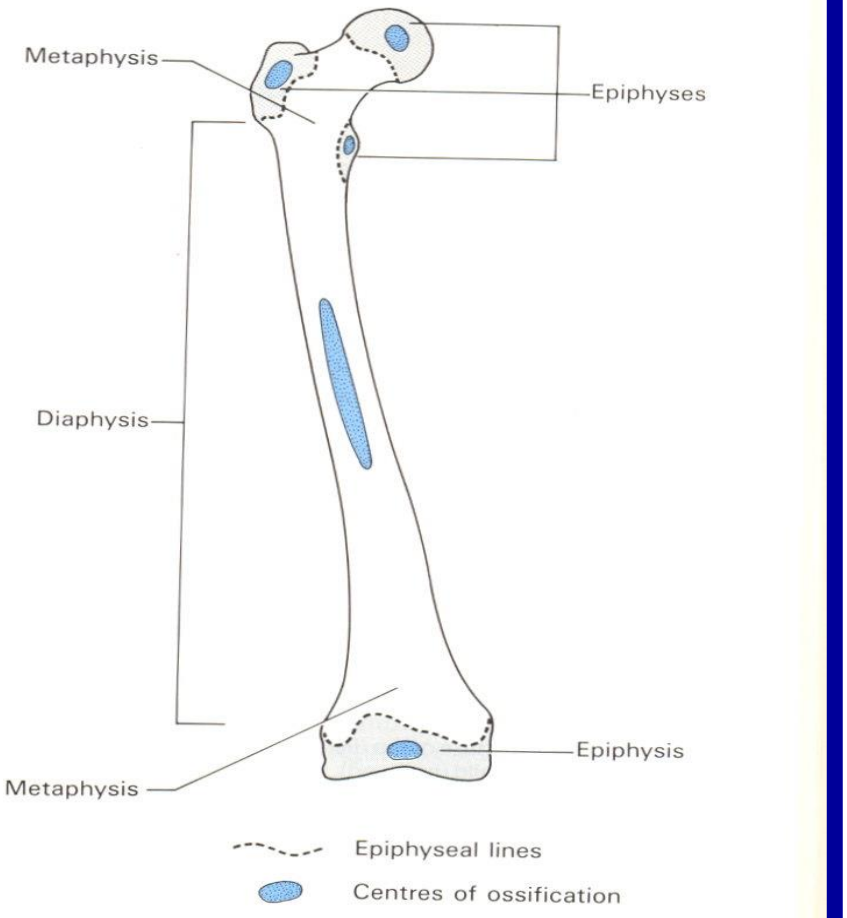


Components of skeletal muscle



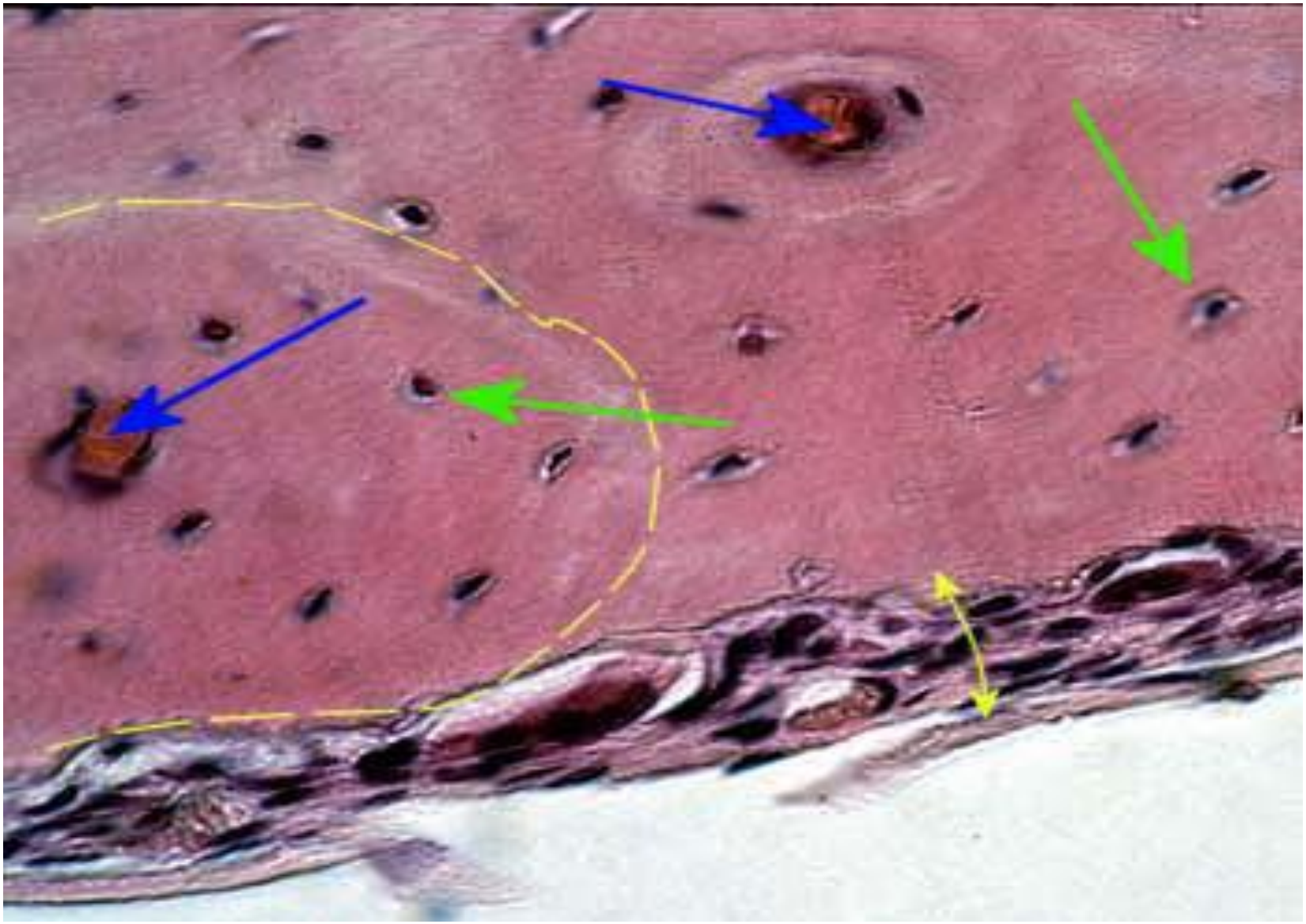
d) myofibril c) muscle fiber b) muscle fiber bundle a) Muscle belly

Structure of a long bone

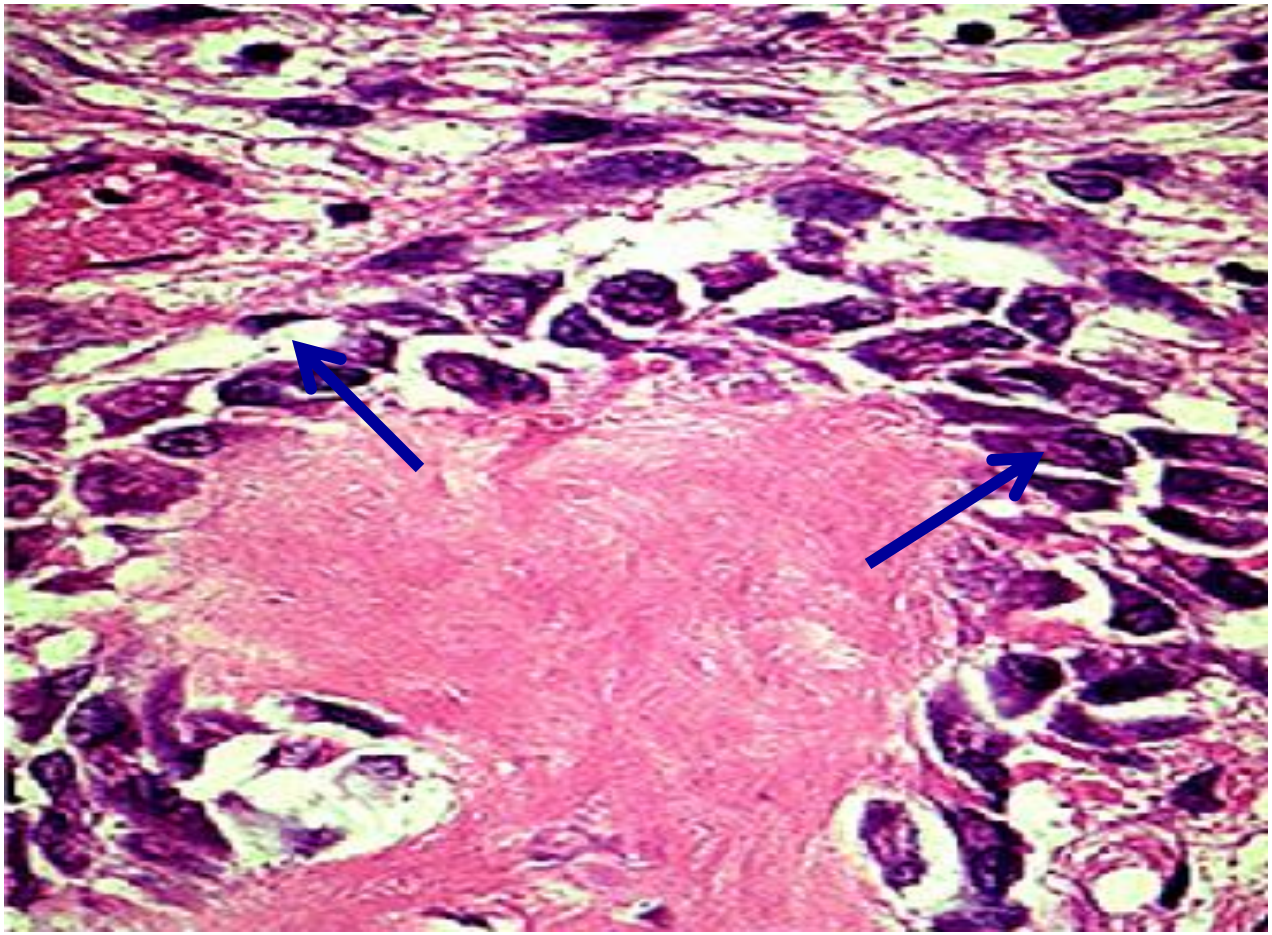


Thin Section of Compact Bone

BONE STRUCTURE - LPF

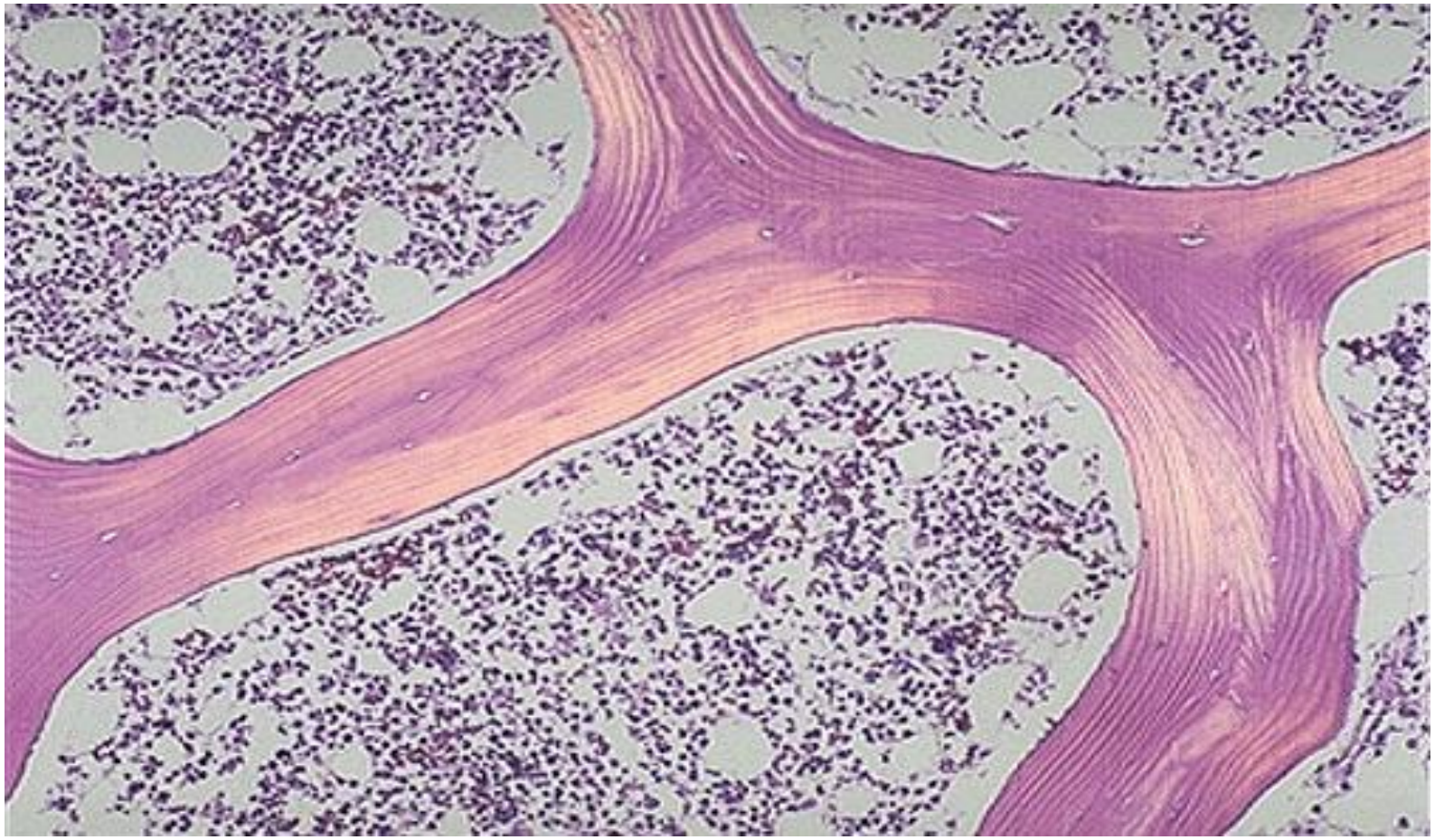


BONE STRUCTURE - HPF



Active osteoblasts synthesizing bone matrix. The surrounding spindle cells represent osteoprogenitor cells

Normal Cancellous Bone - LPF



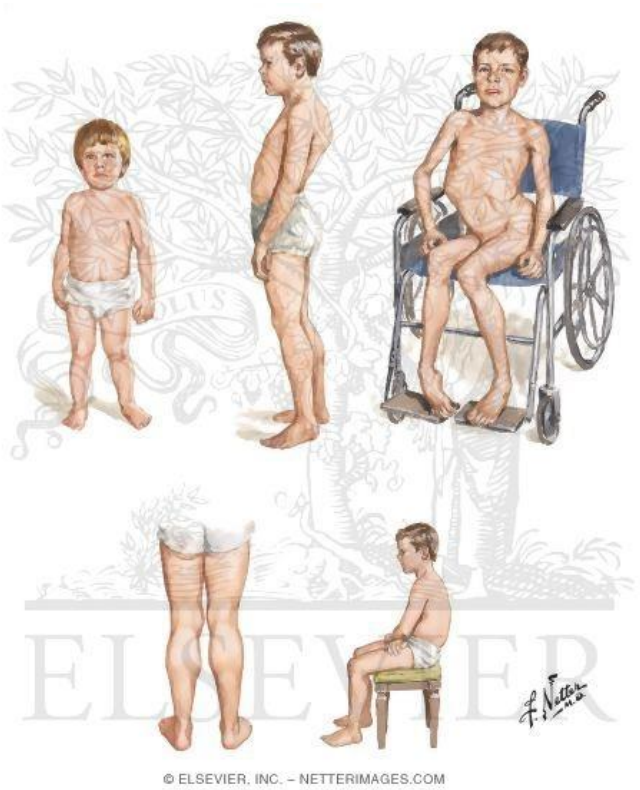
Normal cancellous bone as seen under polarized light microscopy, which highlights the lamellar structure.
The bony spicules are even, with occasional lacunae containing osteocytes.
Cellular marrow is seen between the spicules of bone.

Muscular Dystrophies

Duchenne Muscular Dystrophy (DMD)

Case # 1

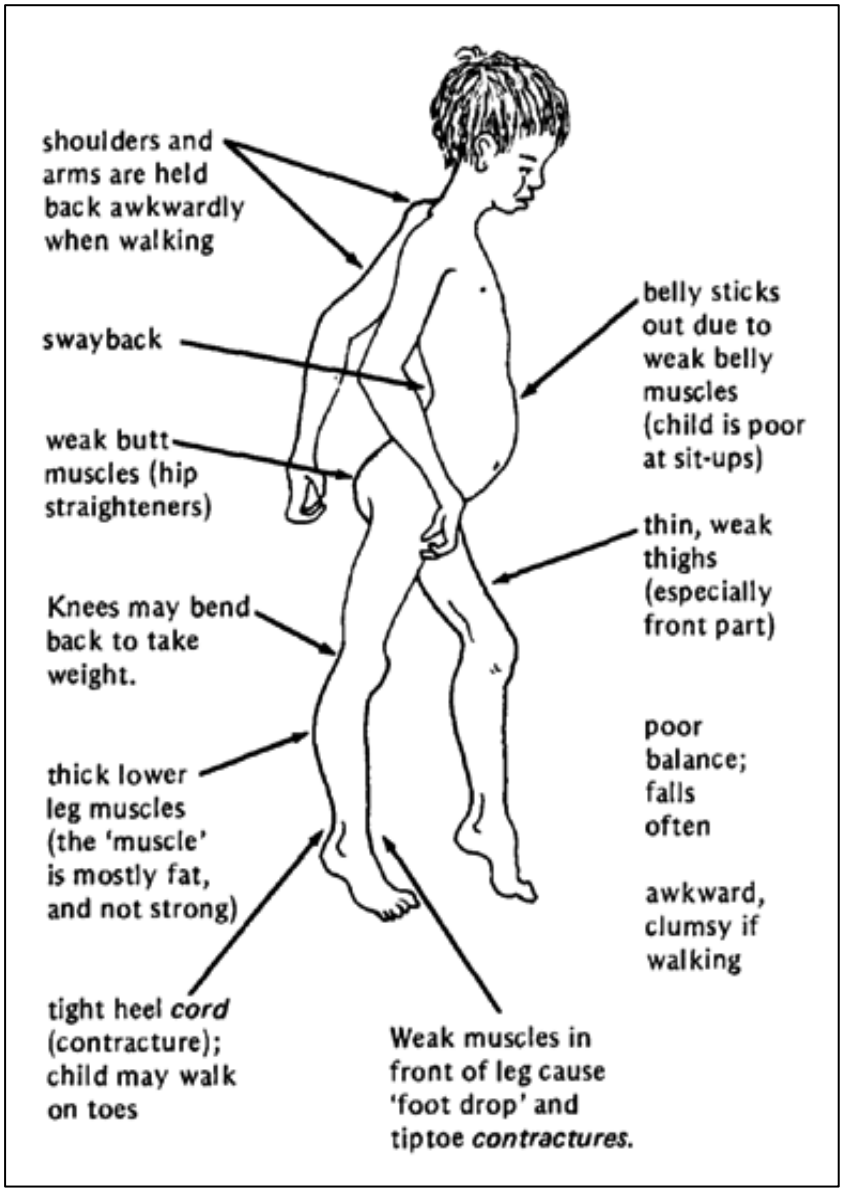
- A 3 - year- old boy presented to his pediatrician with complaint of his parents from difficulty in walking , poor balance , and frequent falls .
- Laboratory investigation shows elevated creatine kinase .
- Muscle biopsy show absence of dystrophin by western blot analysis



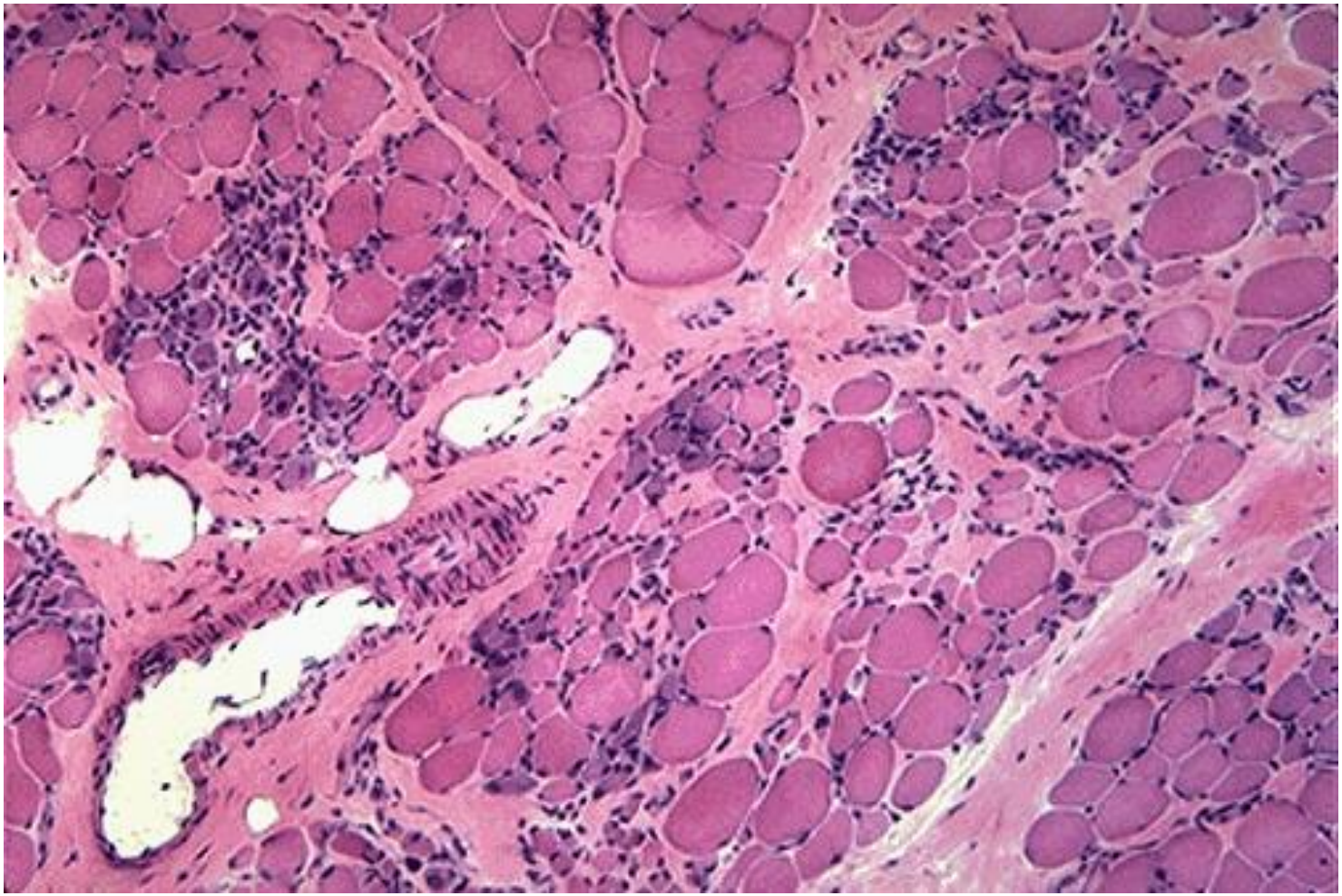
What is your provisional diagnosis?

Duchenne Muscular Dystrophy (DMD)

- DMD is the most severe and common type of muscular dystrophy.
- DMD is characterized by the wasting away of muscles.
- DMD affects mostly males at a rate of 1 in 3,500 births
- Diagnosis in boys usually occurs between 16 months and 8 years.
- Death from DMD usually occurs by age of 30.



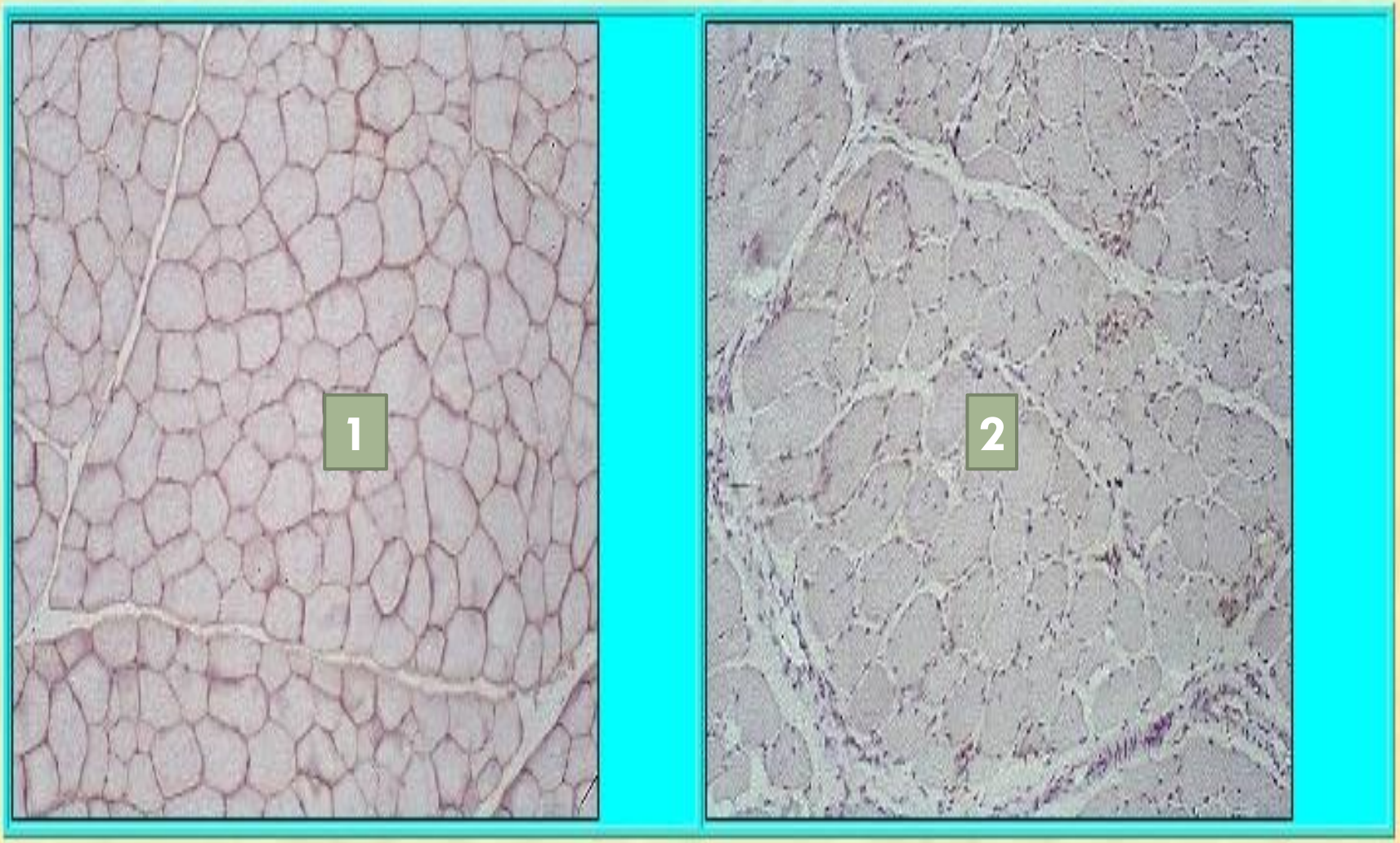
Duchenne Muscular Dystrophy - LPF



Duchenne muscular dystrophy showing variations in muscle fiber size , increased endomysial connective tissue , and regenerating fibers (blue tint)

NORMAL Ms

DMD



In DMD : Dystrophin, an intracellular protein, forms an interface between the cytoskeletal proteins and a group of transmembrane proteins

Dermatomyositis

Case # 2

A 52-year-old woman presents with 6-month history of progressive muscle weakness and a skin rash.

Physical examination is remarkable for a diffuse purple/red discoloration of the skin over her cheeks, nose, and eyelids. Examination confirms proximal muscle weakness.

Laboratory findings show an increase in creatine kinase (10 times the normal).

Dermatomyositis

- is an autoimmune disorder characterized by inflammation of muscle tissue and a skin rash.
- Occurs more frequently in women.

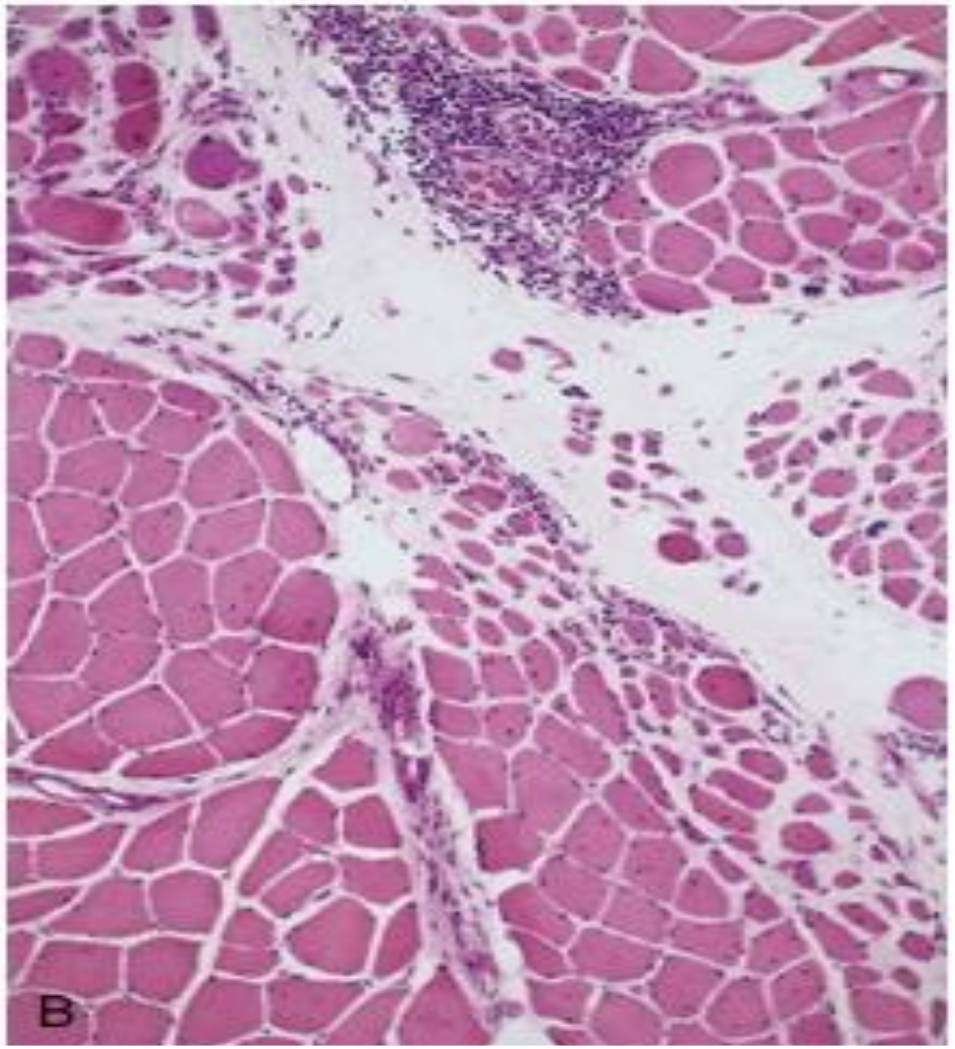
-Purple/red colored discoloration mainly around eyelids

-Anti nuclear antibodies (ANA) and Creatinine kinase (CK) levels are useful lab test to diagnose this disease.

-Dermatomyositis can be first manifestation of paraneoplastic disorders.

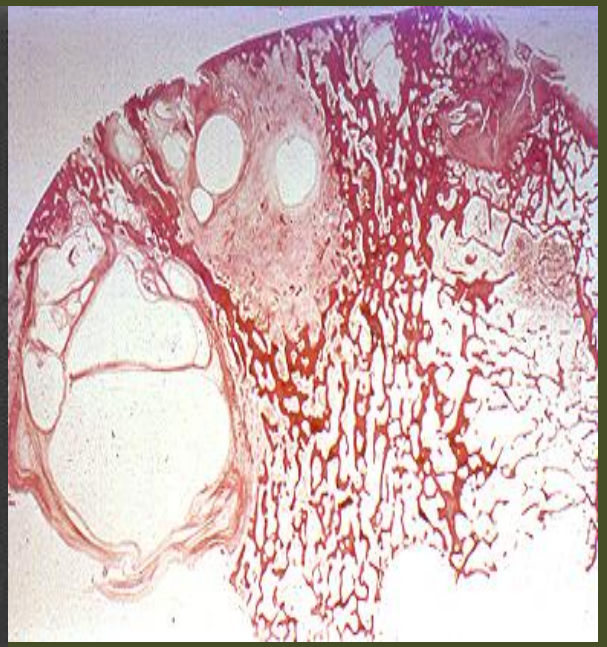
Dermatomyositis

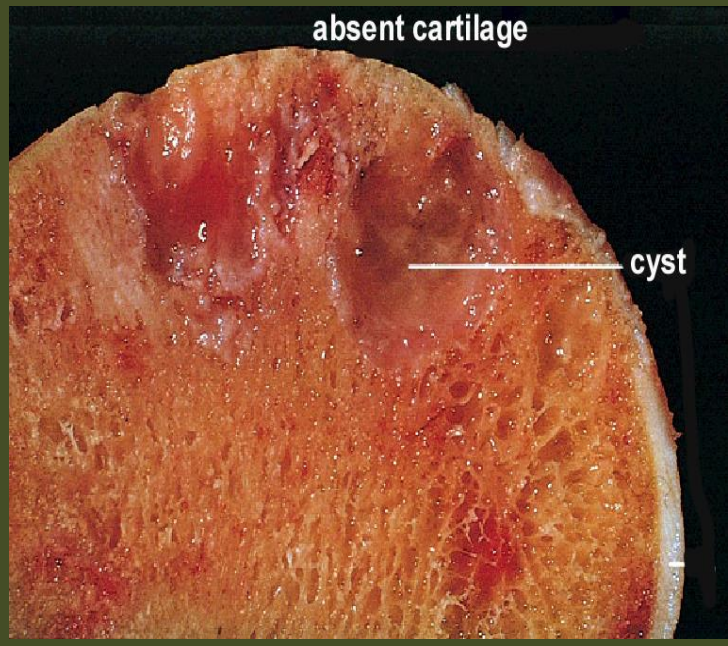
- Perifascicular atrophy of muscle fibers and chronic inflammation .



NON INFECTIOUS ARTHRITIS

Osteoarthritis

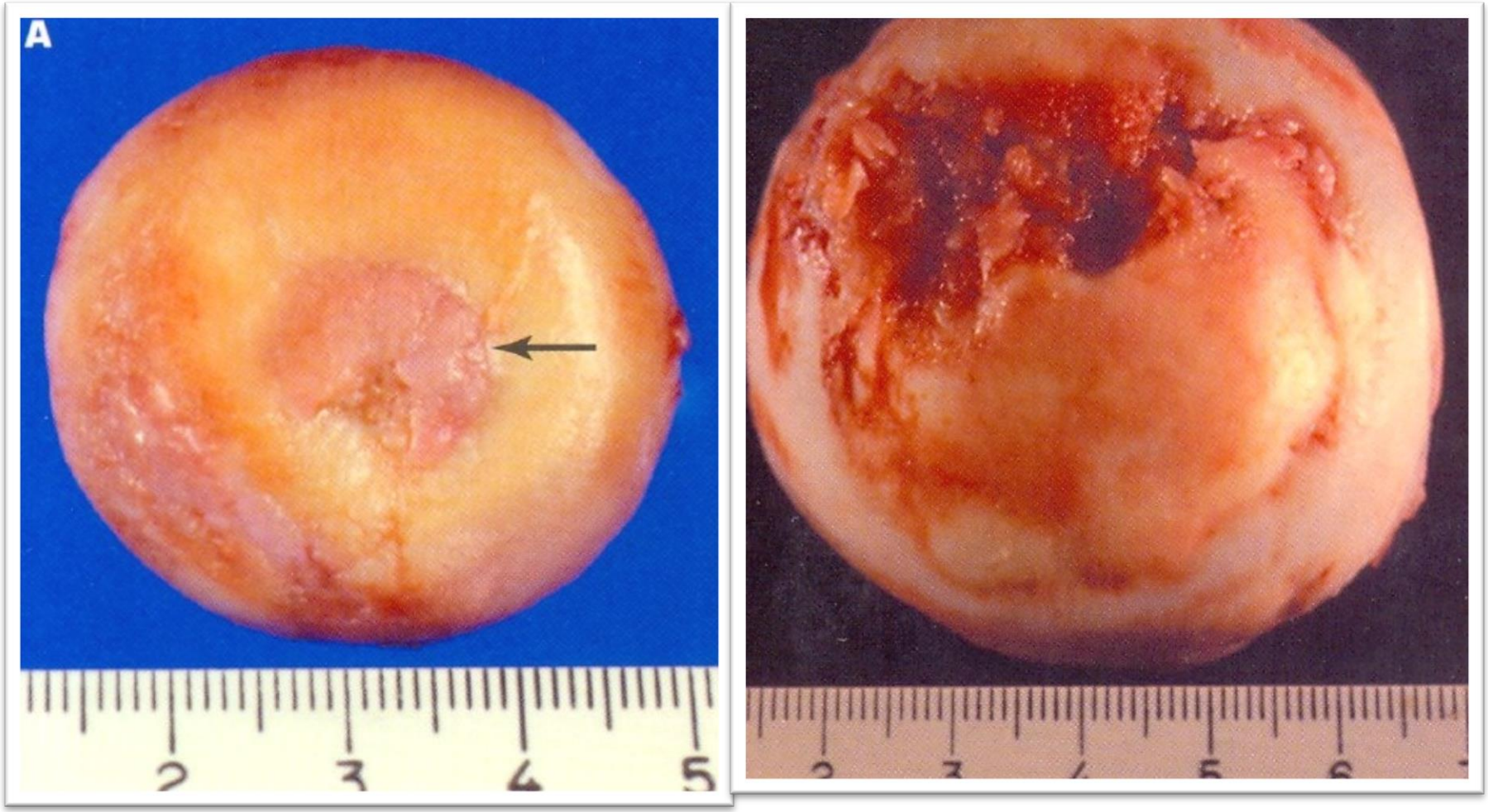




Case # 3

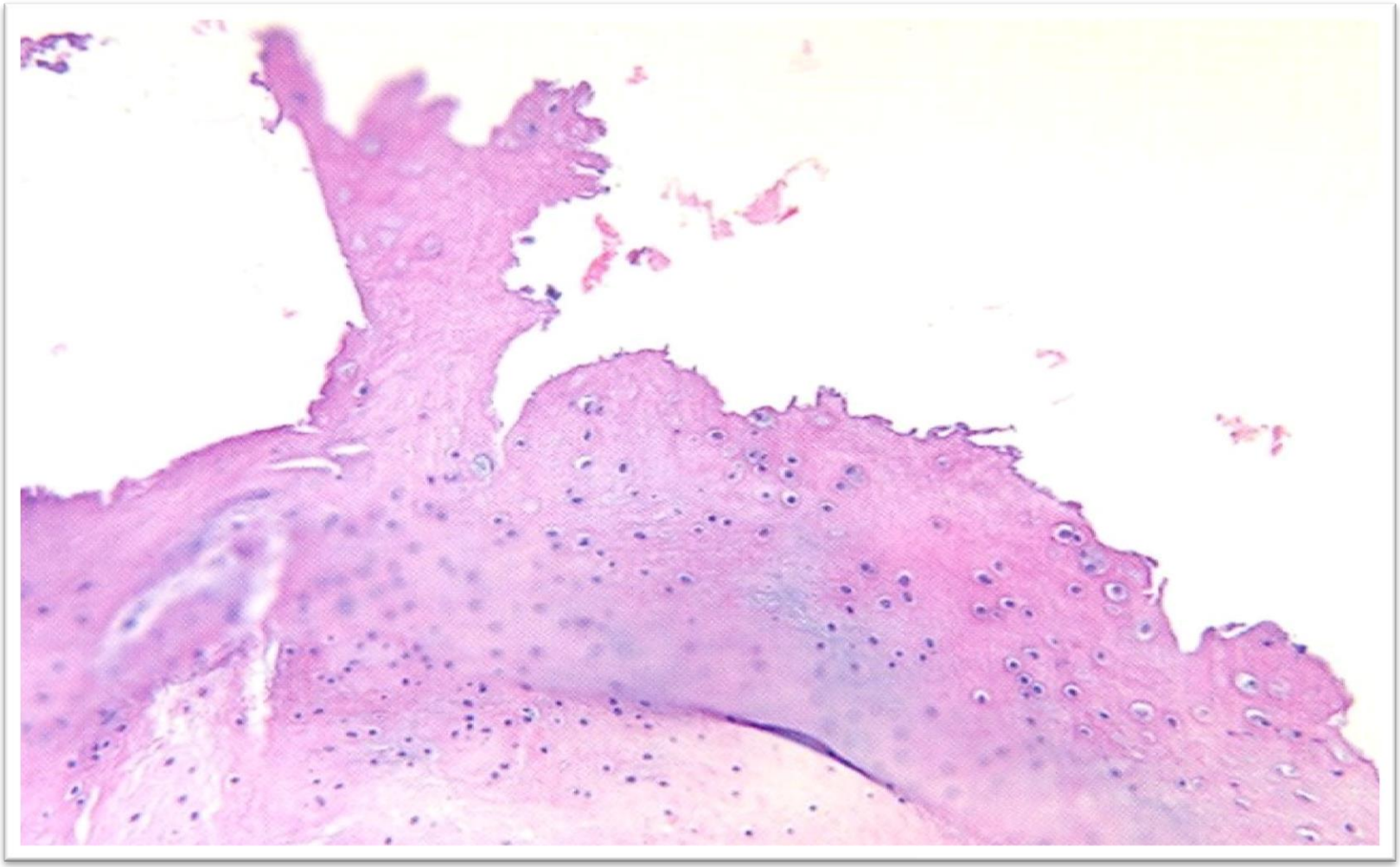
- An obese 56-year-old woman presented with bilateral localized pain to her knees, hands and difficulty in walking .

Osteoarthritis - Gross



Progressive erosion of articular cartilage, eburnated articular surface , subchondral cyst and residual articular cartilage (Osteoarthritis)

Osteoarthritis - LPF



Mushroom-shaped osteophytes (bony outgrowths) develop at the margins of the articular surface and are capped by fibrocartilage and hyaline cartilage that gradually ossify . Note the absence of inflammation . (Osteoarthritis)

Case # 4

- A 45 -year- old woman complains of low grade fever , malaise and stiffness in her joints each morning .

Rheumatoid Arthritis

Swelling and deformity of the metacarpo-phalyngeal joints and ulnar deviation of the fingers

Serological tests which are somewhat specific for this disease:

1- Rheumatoid factor (RF)

2- Antibodies to citrullinated peptides in the serum

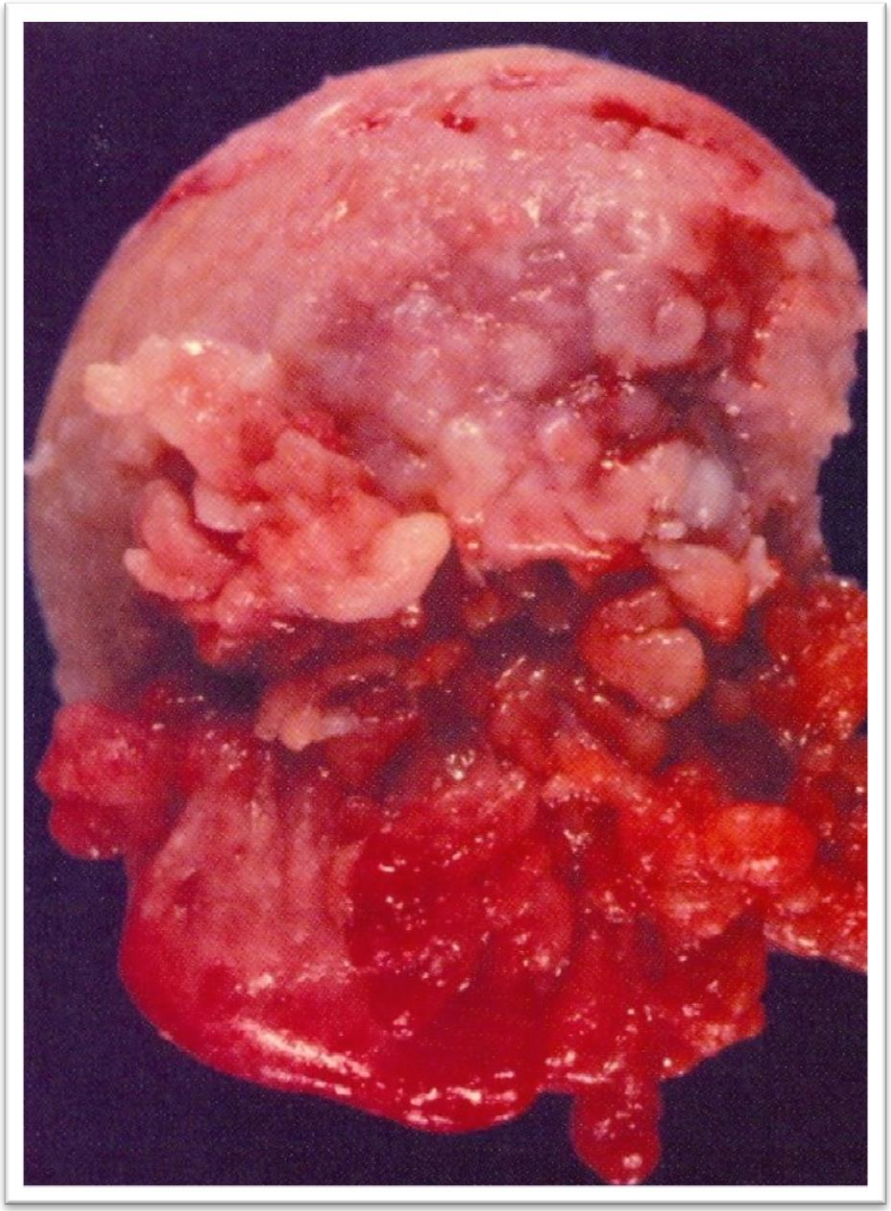
3- C-Reactive protein (CRP) and ESR (Non specific)

Rheumatoid arthritis

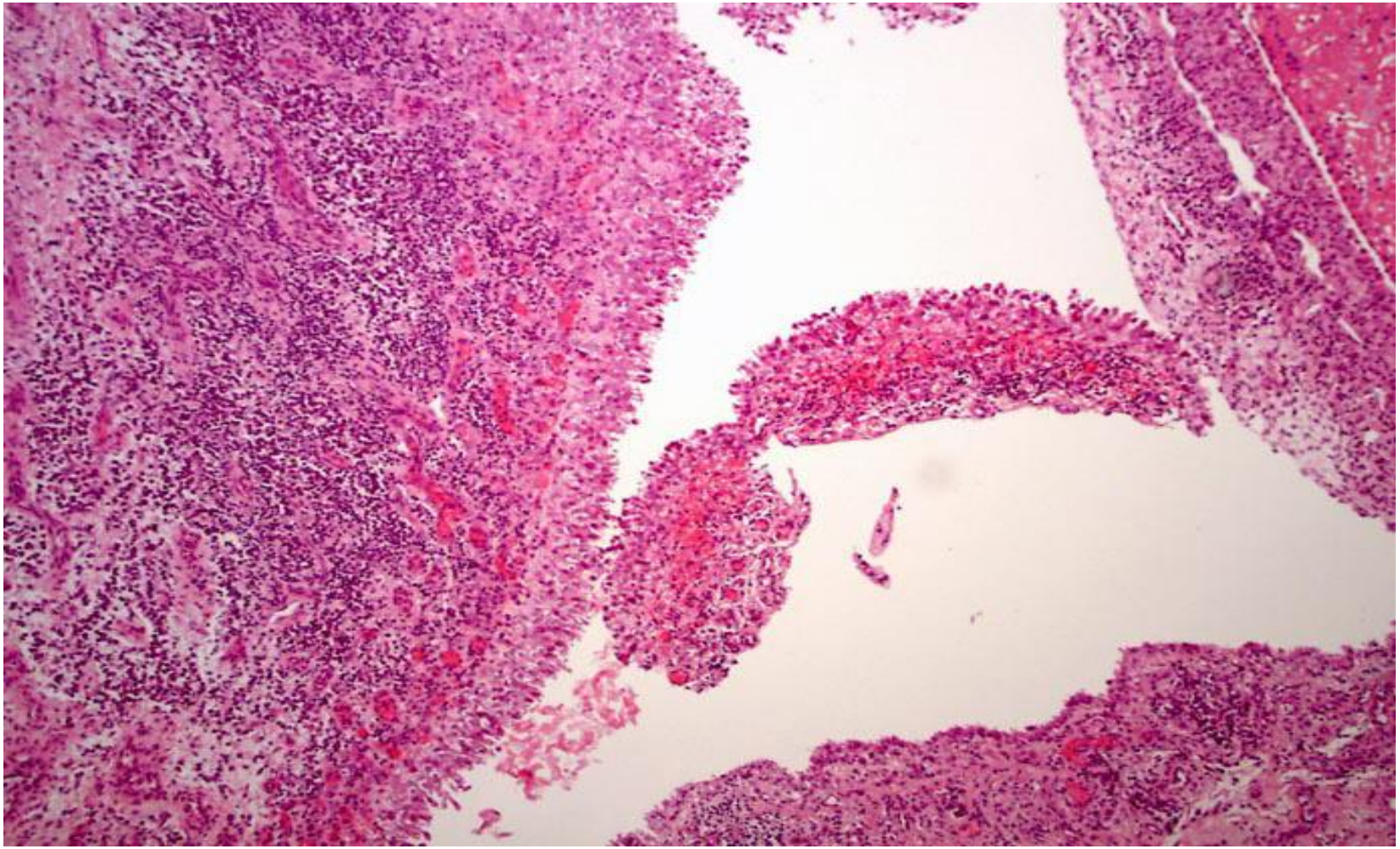
affecting the head of the femur.

-- The synovium becomes edematous, thickened and hyperplastic and transforming its smooth contour to one covered by delicate and bulbous fronds .

--Cytokines are involved in the pathogenesis of the disease. Few of them are Interleukin 1, Tumor necrosis factor , Interleukin 6,8,17

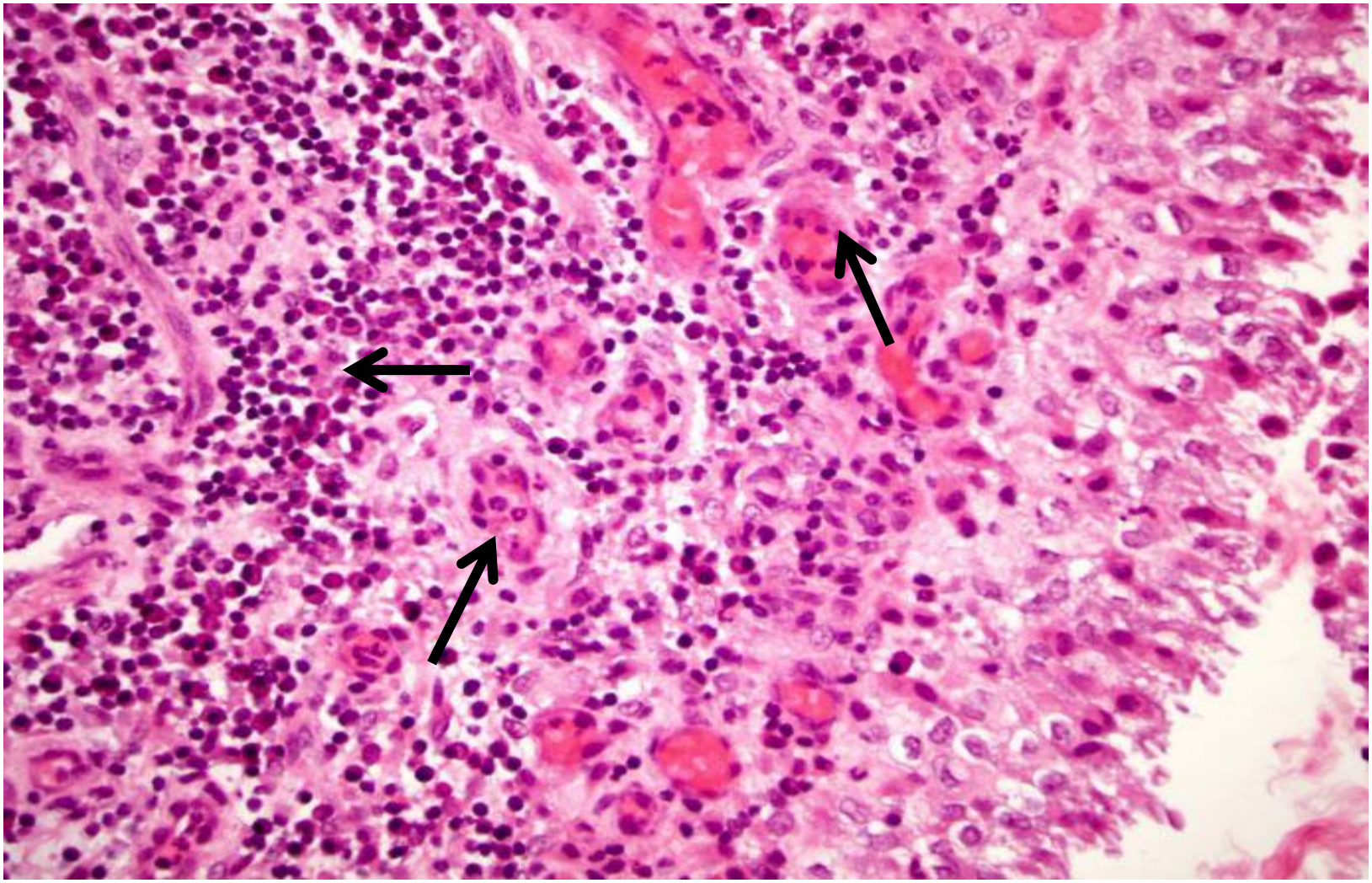


Hyperplastic Synovium - LPF



***Hyperplastic synovial lining** with villous like projections , underlying dense lymphocytic infiltration and vascular congestion*

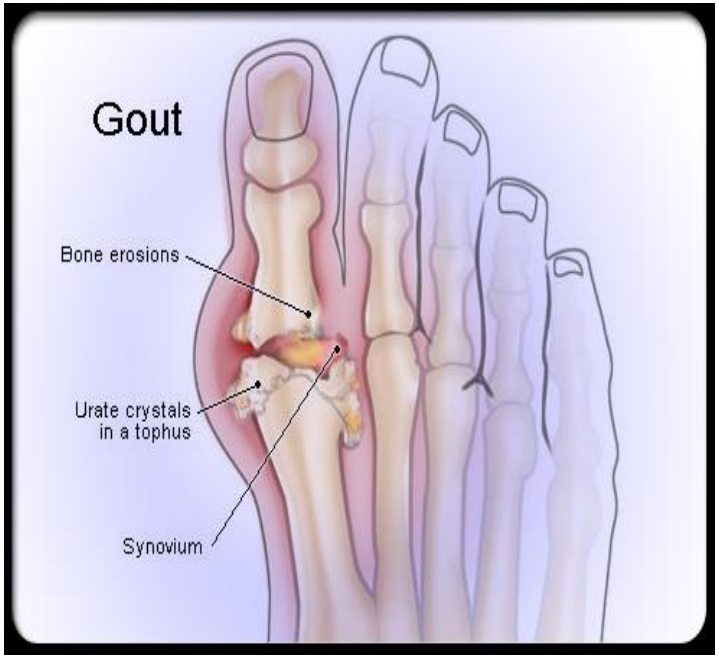
Hyperplastic Synovium - HPF



Hyperplastic synovium *with underlying plasma cells and lymphocytes including many congested blood vessels in* **Rheumatoid arthritis**

GOUT

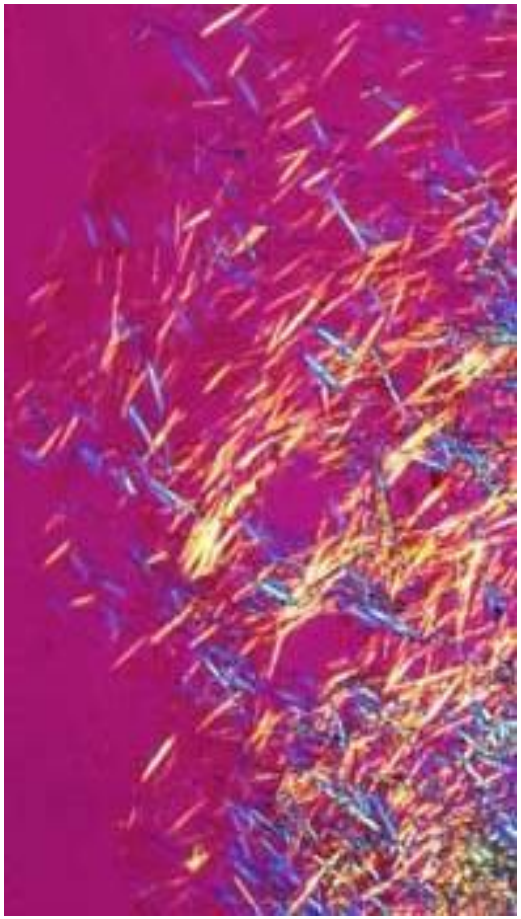
Gout is a syndrome caused by the inflammatory response to tissue deposition of monosodium urate crystals (MSU).



Acute gouty arthritis on the big toe of an elderly man.

Severe gout in the fingers resulting in large, hard deposits of crystals of uric acid. These deposits are called Tophi

Needle-shaped monosodium urate crystals diagnostic of gout from an acutely inflamed joint as seen under polarized microscopy



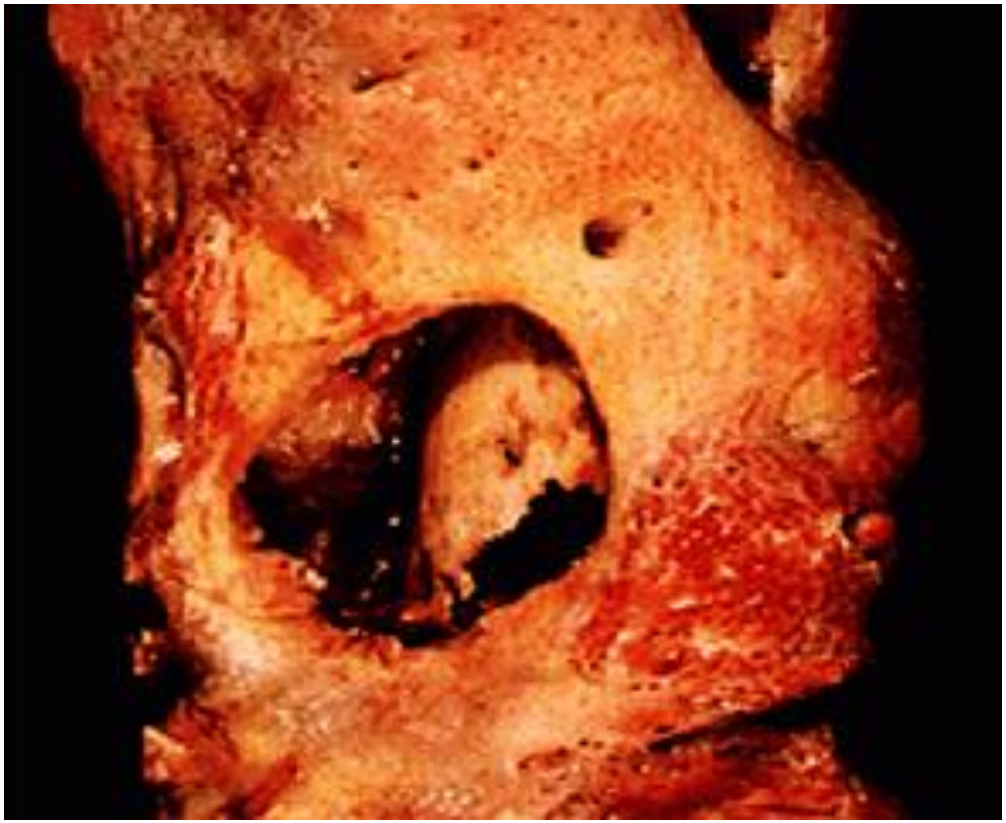
- Gouty Arthritis can be associated with

Leukemia, Chronic renal diseases

- Pyrophosphate overproduction or decreased breakdown can give rise to Pseudogout or chondrocalscinosis.

Osteomyelitis

Osteomyelitis



Resected femur in a patient with draining osteomyelitis. The drainage tract in the subosteal shell of viable new bone (involucrum) reveals the inner native necrotic cortex (sequestrum)

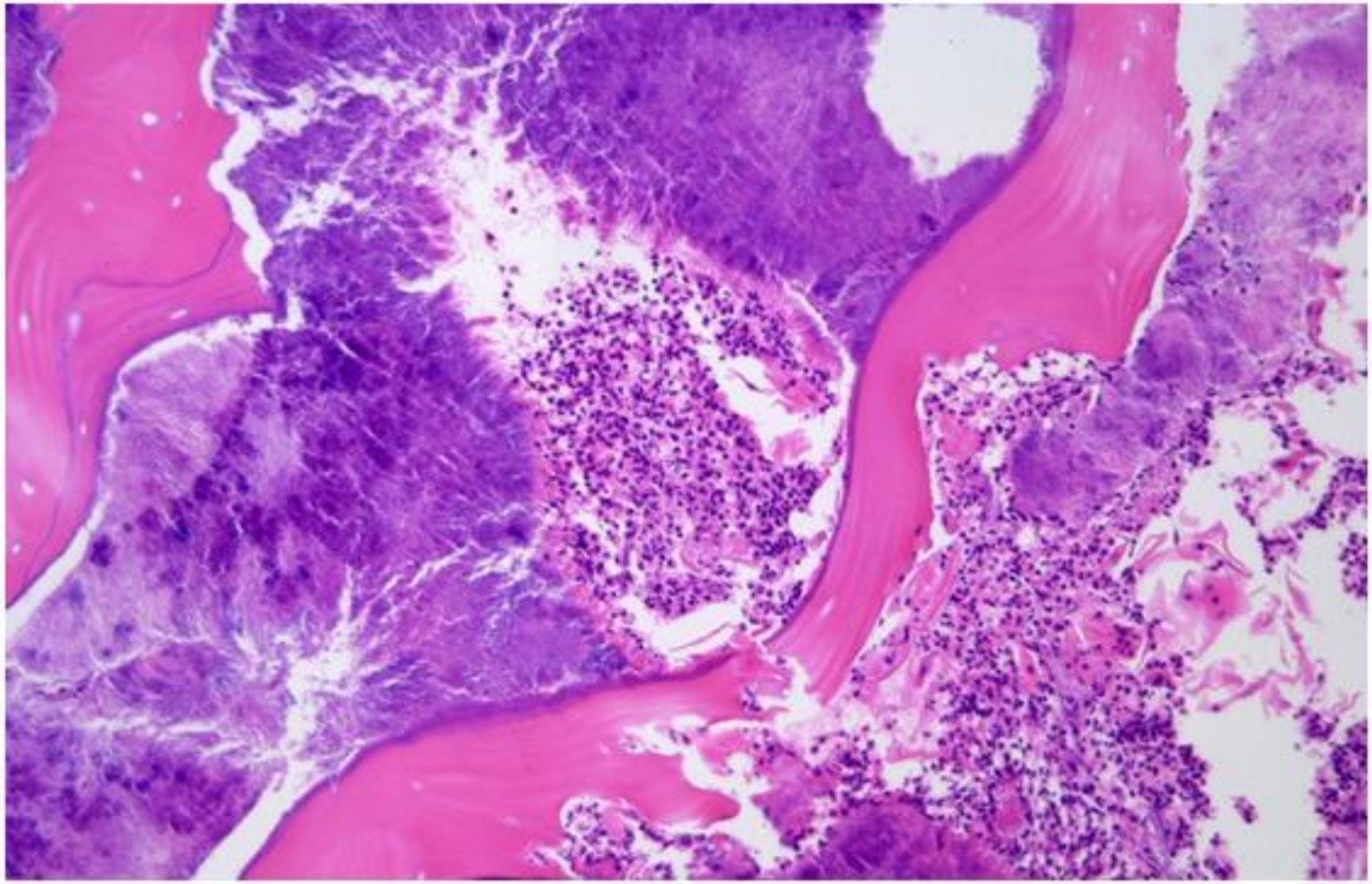
- Direct infection of bone.
- Bacterial most often
  - Staphylococcus
  - Salmonella
    - Sickle Cell Disease
  - Tuberculosis
    - Spine first

Case # 5

- A 22- year- old male presented with localized pain above his right knee joint with recurrent fever. Later, he had a discharging sinuses from the skin overlying the right knee.

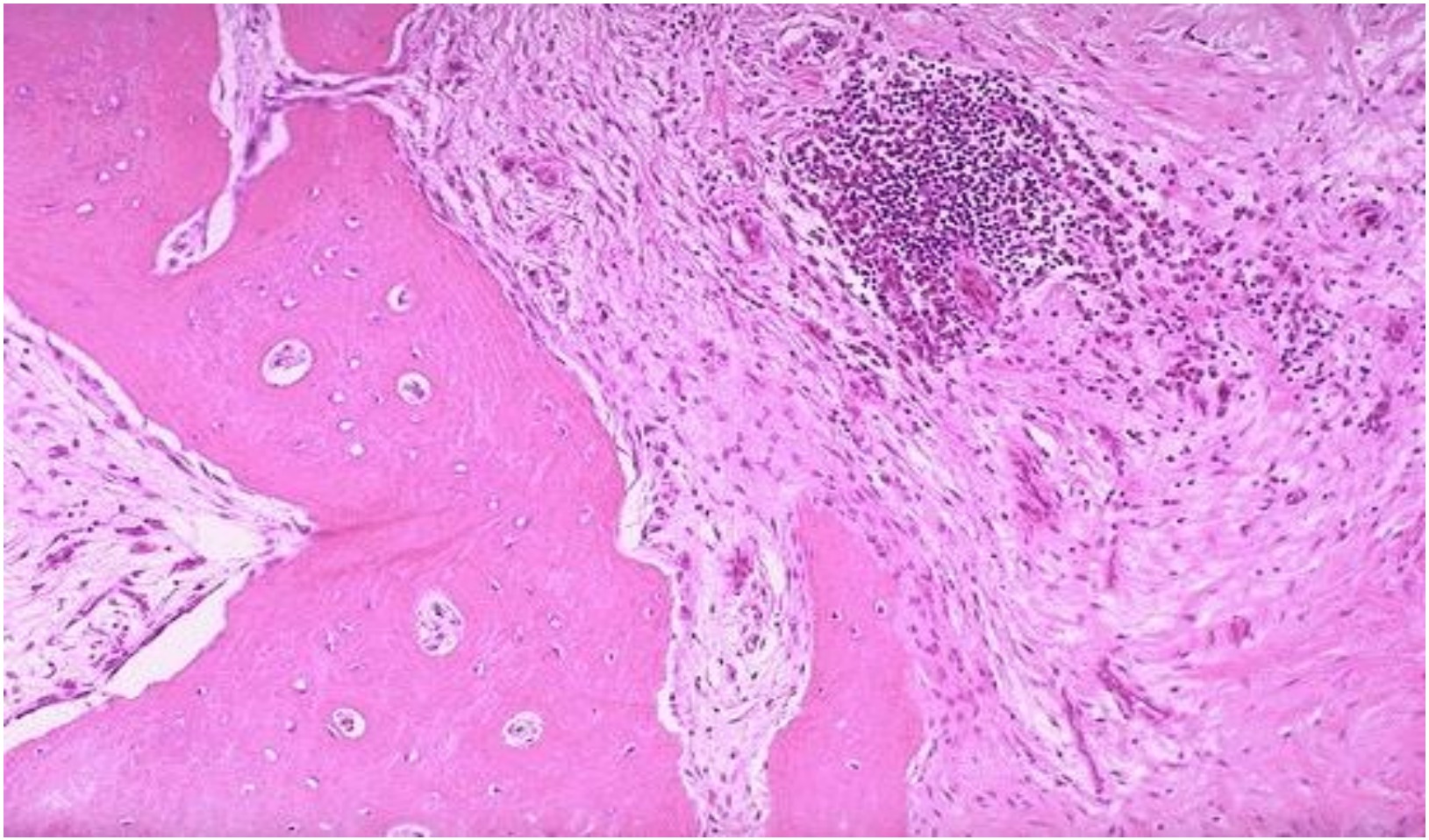
What is the most likely diagnosis ?

Acute Osteomyelitis - LPF



***Acute Osteomyelitis*. Bony sequestrae are surrounded by colonies of bacteria as well as purulent infiltrate.**

Chronic Osteomyelitis - LPF



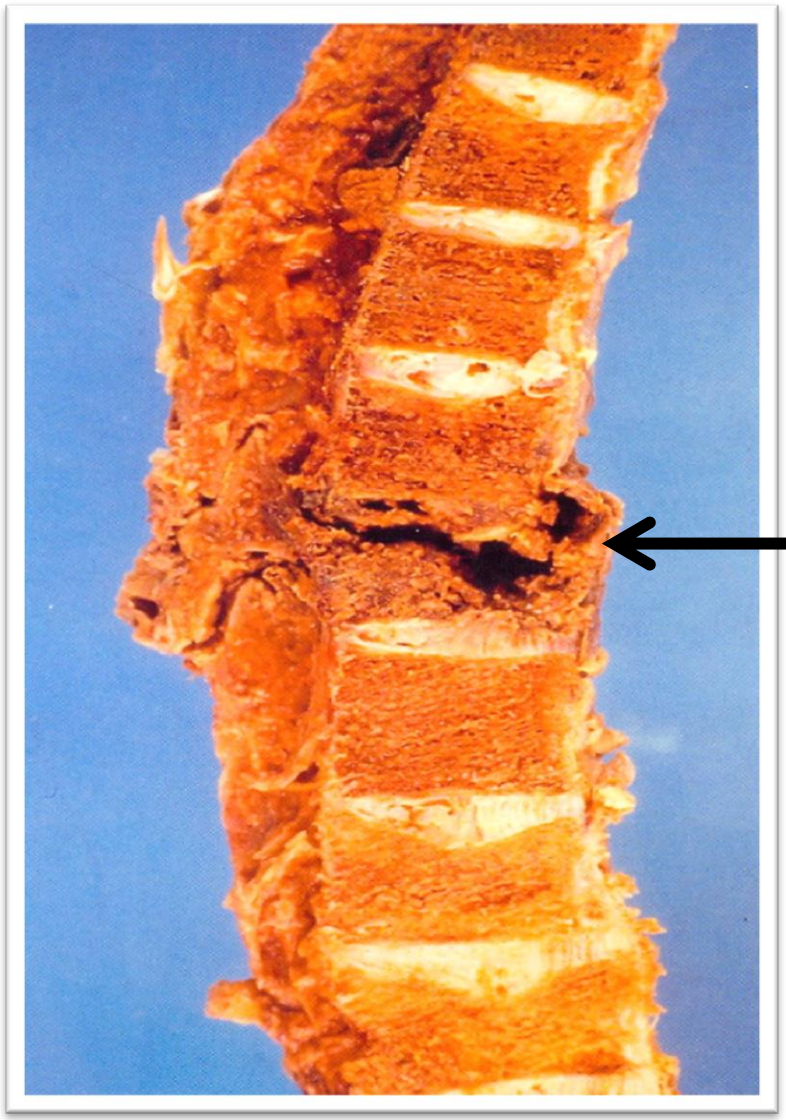
***Chronic Osteomyelitis*. Note the fibrosis of the marrow space accompanied by chronic inflammatory cells. There can be bone destruction with remodeling.**

Spinal TB – Pott's Disease
(Tuberculous Osteomyelitis)

Case # 6

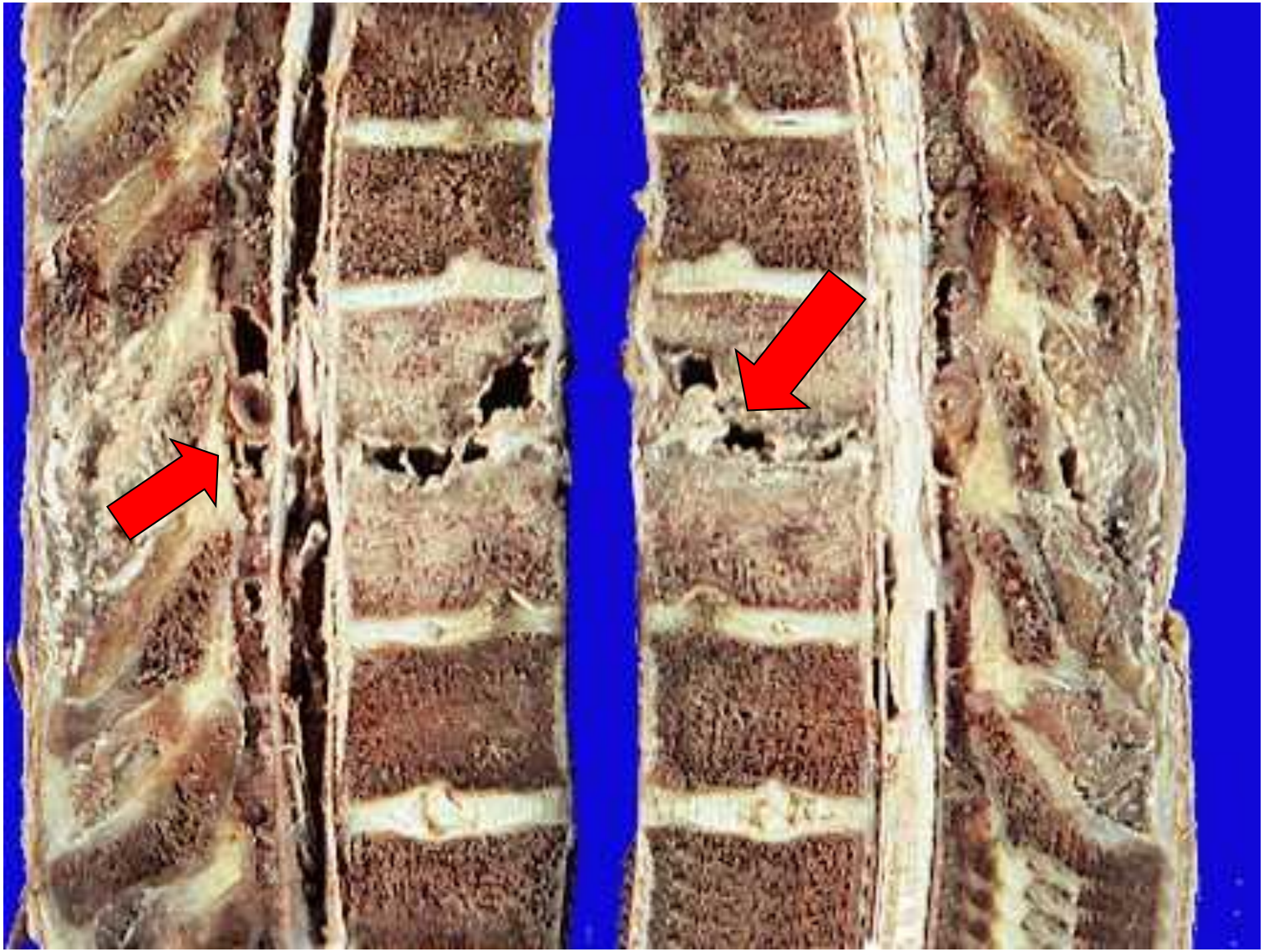
- A 30 -year-old debilitated man presented to the orthopedic clinic with back pain, low grade fever, marked elevation of sedimentation rate and recent kyphosis and scoliosis .
- The patient has a history of coughing up blood, fever, chills, night sweats, weight loss, pallor, and often a tendency to fatigue very easily.

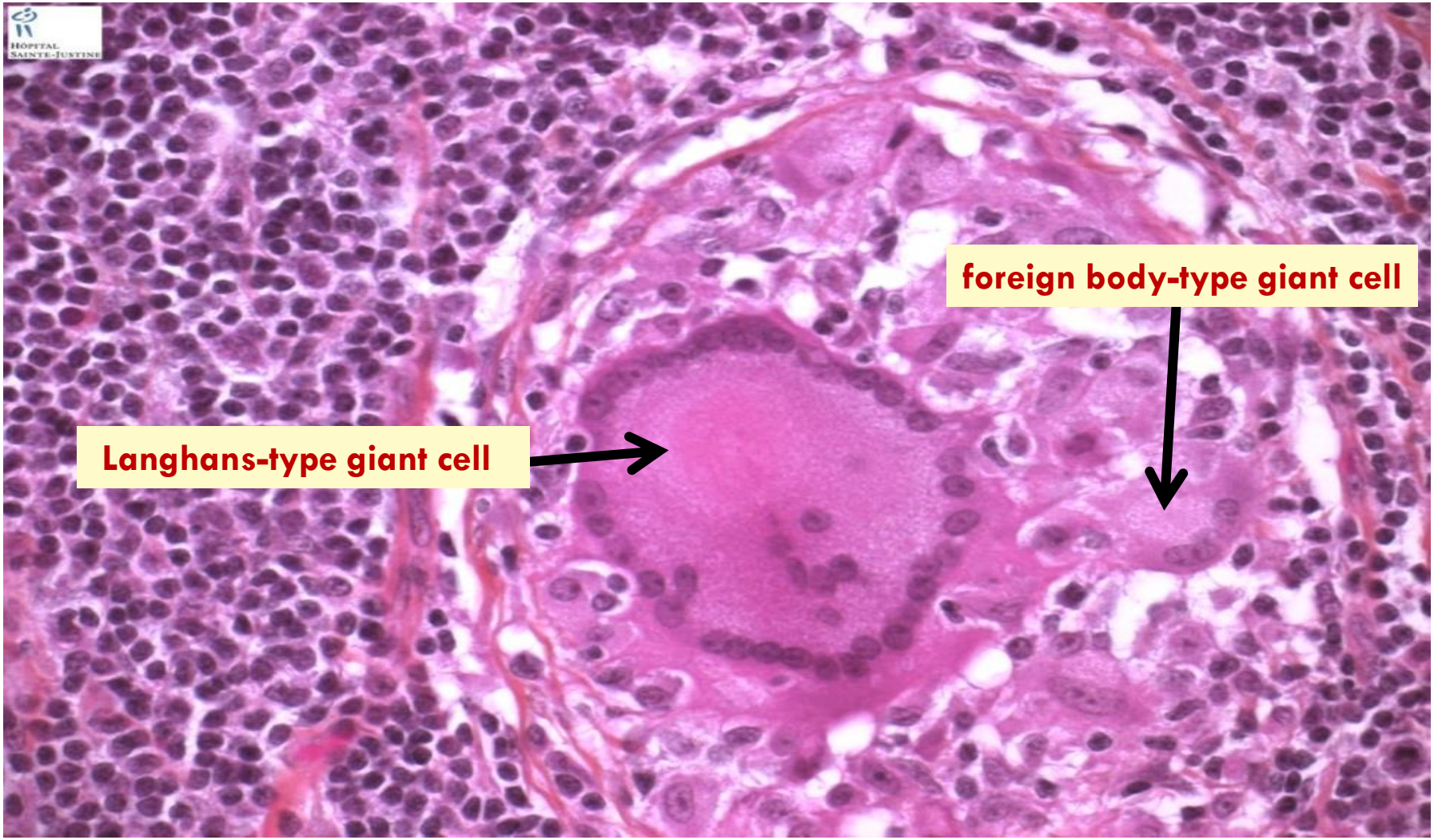
Gross pathology of T.B Osteomyelitis of the vertebral Column (Pott's Disease)



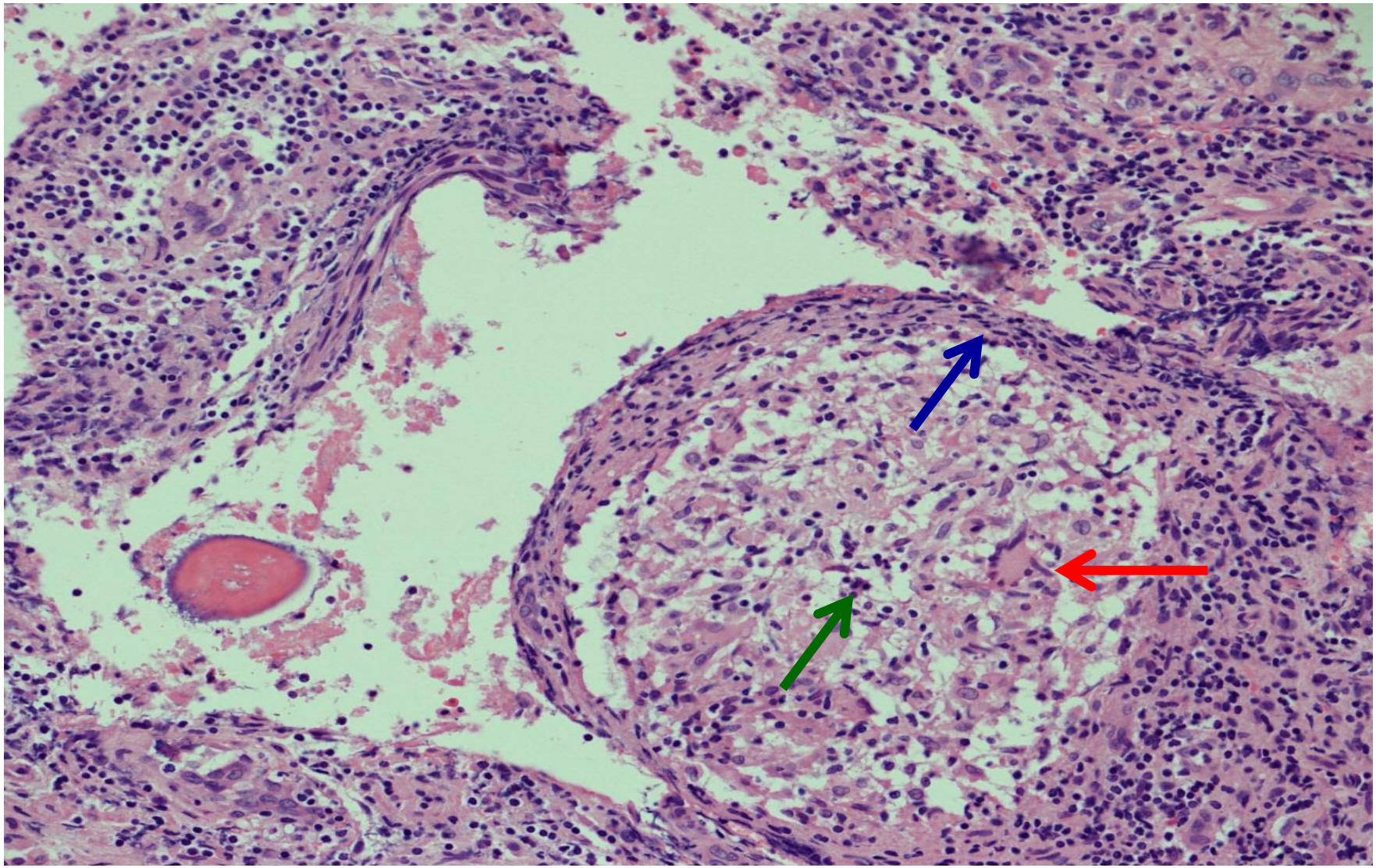
Granulomatous necrosis of vertebral column

Gross pathology of T.B. Osteomyelitis of the vertebral spines (Pott's Disease)

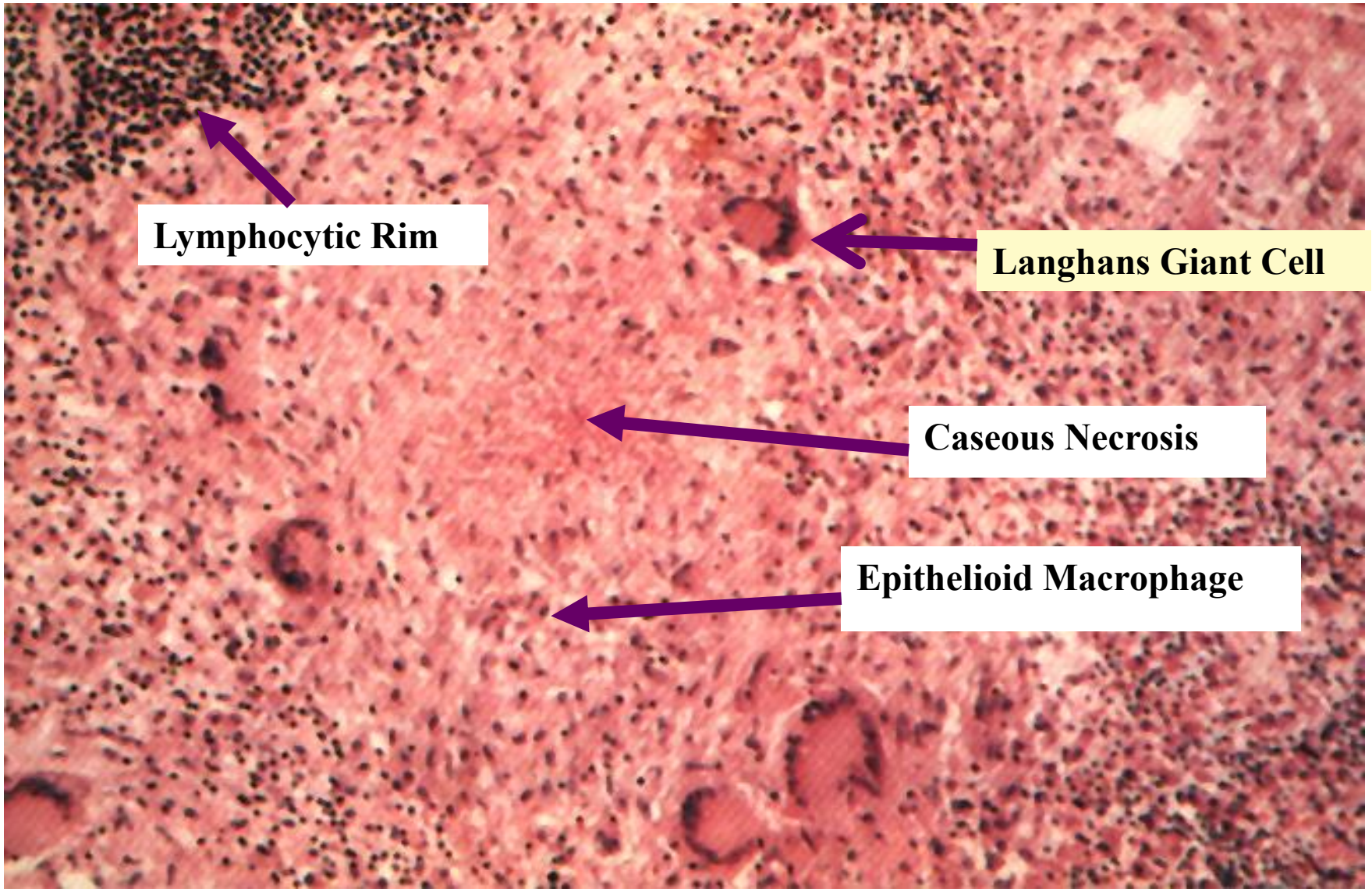




- *Bone section shows Epithelioid cells fuse to form giant cells containing 20 or more nuclei. The nuclei arranged either peripherally (Langhans-type giant cell) or haphazardly (foreign body-type giant cell). These giant cells can be found either at the periphery or the center of the granuloma.*



Section of bone shows granuloma formation with epithelioid like cells , langhans-type giant cells and rim of lymphocytes

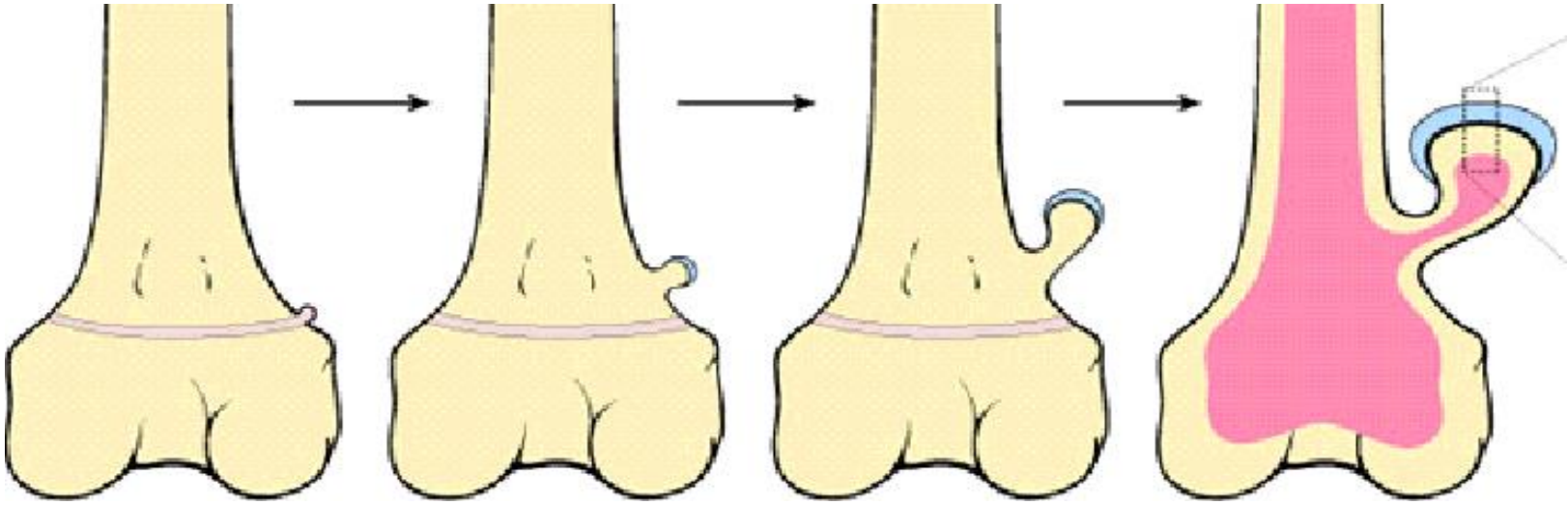


Section of bone shows granuloma formation with epithelioid like cells , langhans-type giant cells and rim of lymphocytes

BONE TUMORS

Osteochondroma
(osteochondroma exostosis)

Osteochondroma
(osteochondroma exostosis)



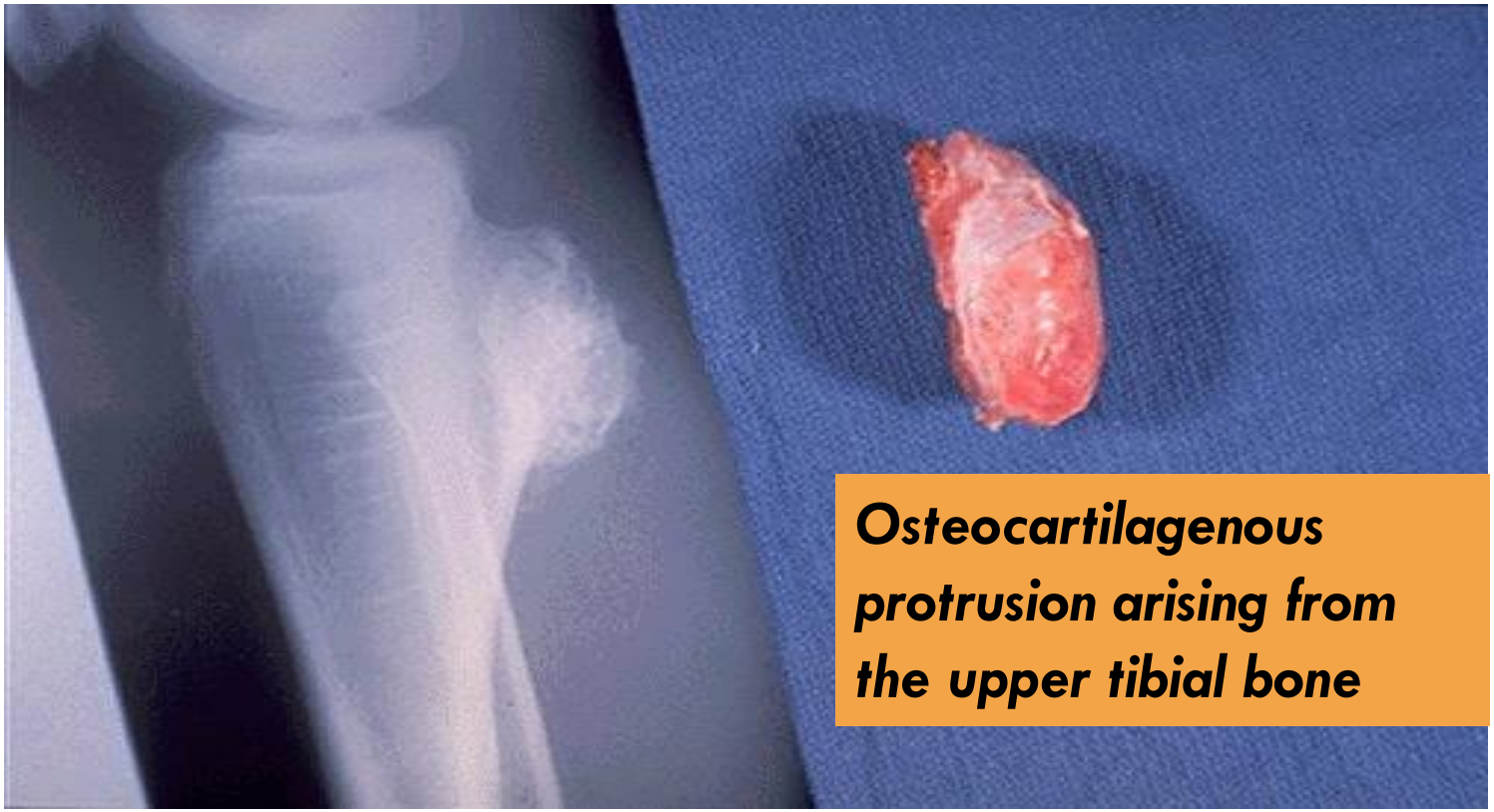
- The solitary osteochondroma is the most common benign bone tumors
- Seen in patients aged from 10-30 years
- Arise during skeletal growth
- Equally in males and females
- Etiology is unknown

Case # 7

- A 16 -year-old male was found to have a small swelling protruding from upper part of his leg with local pain .

MRI picture showing two osteochondromatous exostosis which are arising from the upper third of fibula .

Osteochondroma: Gross & X-ray

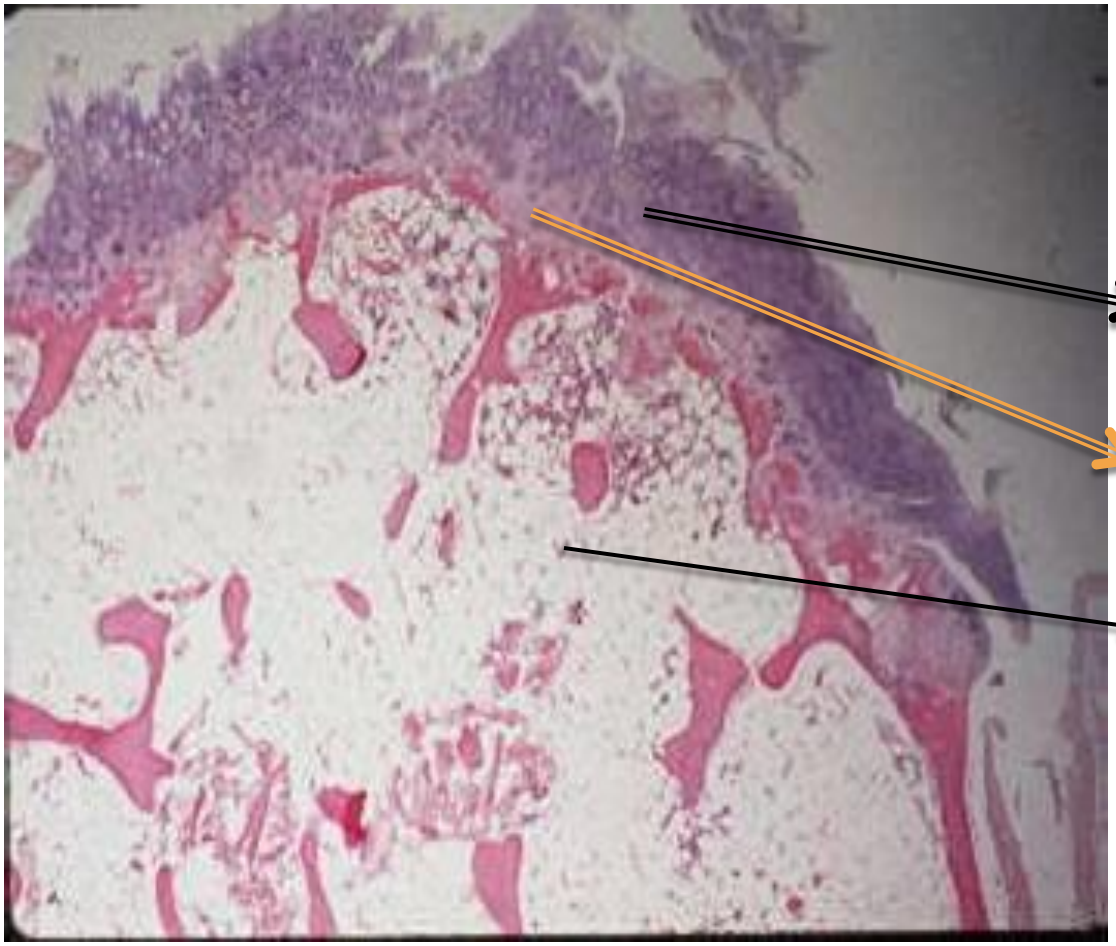


Most are solitary, incidental lesions that may be excised if they cause local pain. There is a rare condition of multiple osteochondromatosis marked by bone deformity and by a greater propensity for development of chondrosarcoma.

Osteochondroma - Gross

Solitary osteochondroma. Gross osteochondroma specimen at the time of resection. Bone stalk and overlying membrane on cartilage cap.

Osteochondroma - LPF



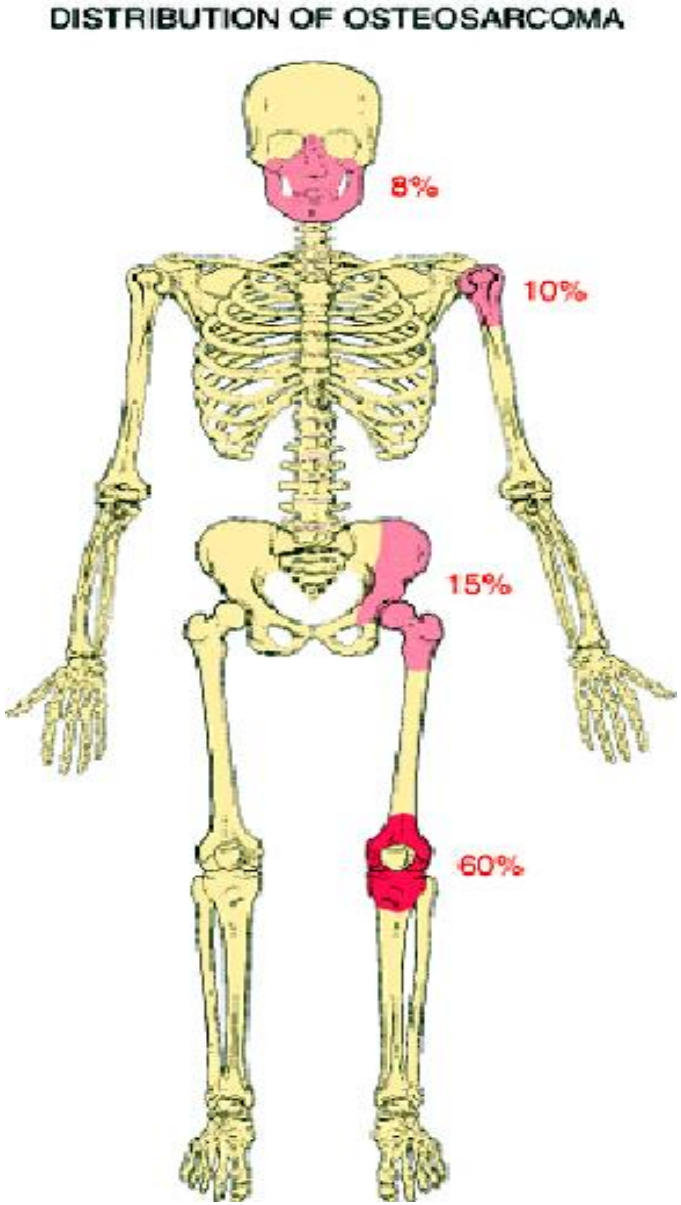
The microscopic appearance of an osteochondroma displays the benign cartilagenous cap at the upper and the bony cortex at the left lower.

Prognosis is Excellent **Possible complication :** *- Chondrosarcoma may occur if these lesions are multiple*

Osteosarcoma

Osteosarcoma, Primary Malignancy

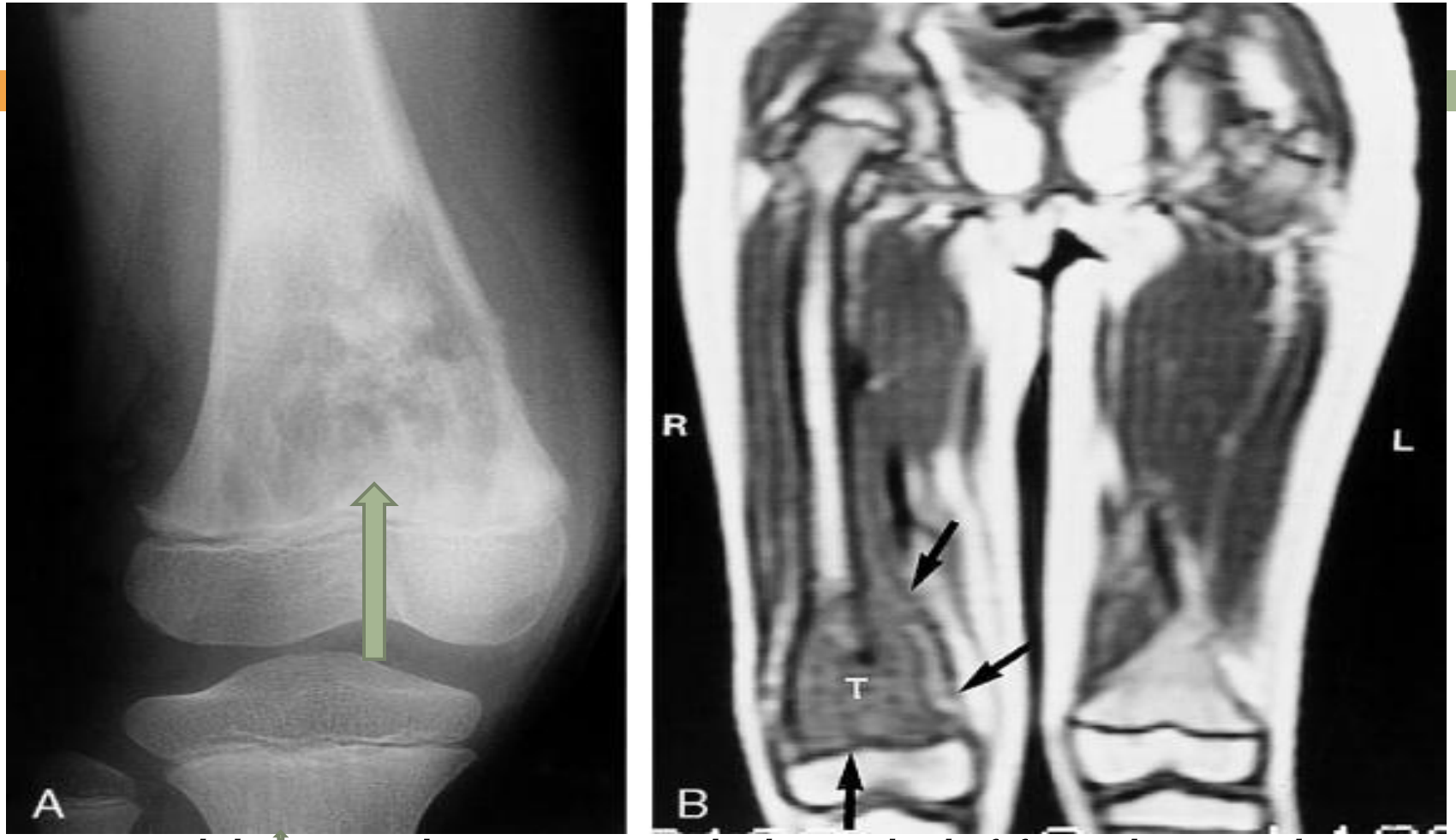
- Weight bearing
- Long bones
- Young people
- Osteoblast is malignant cell
- Genetics of tumor being unraveled



Case # 8

- An 18-year-old female presented to the rheumatology clinic with 2 months history of pain and swelling in her upper thigh with weight loss .

Central Osteosarcoma



A: Lytic and destructive lesion is seen in the lower third of femur bone on this anteroposterior view of the knee.

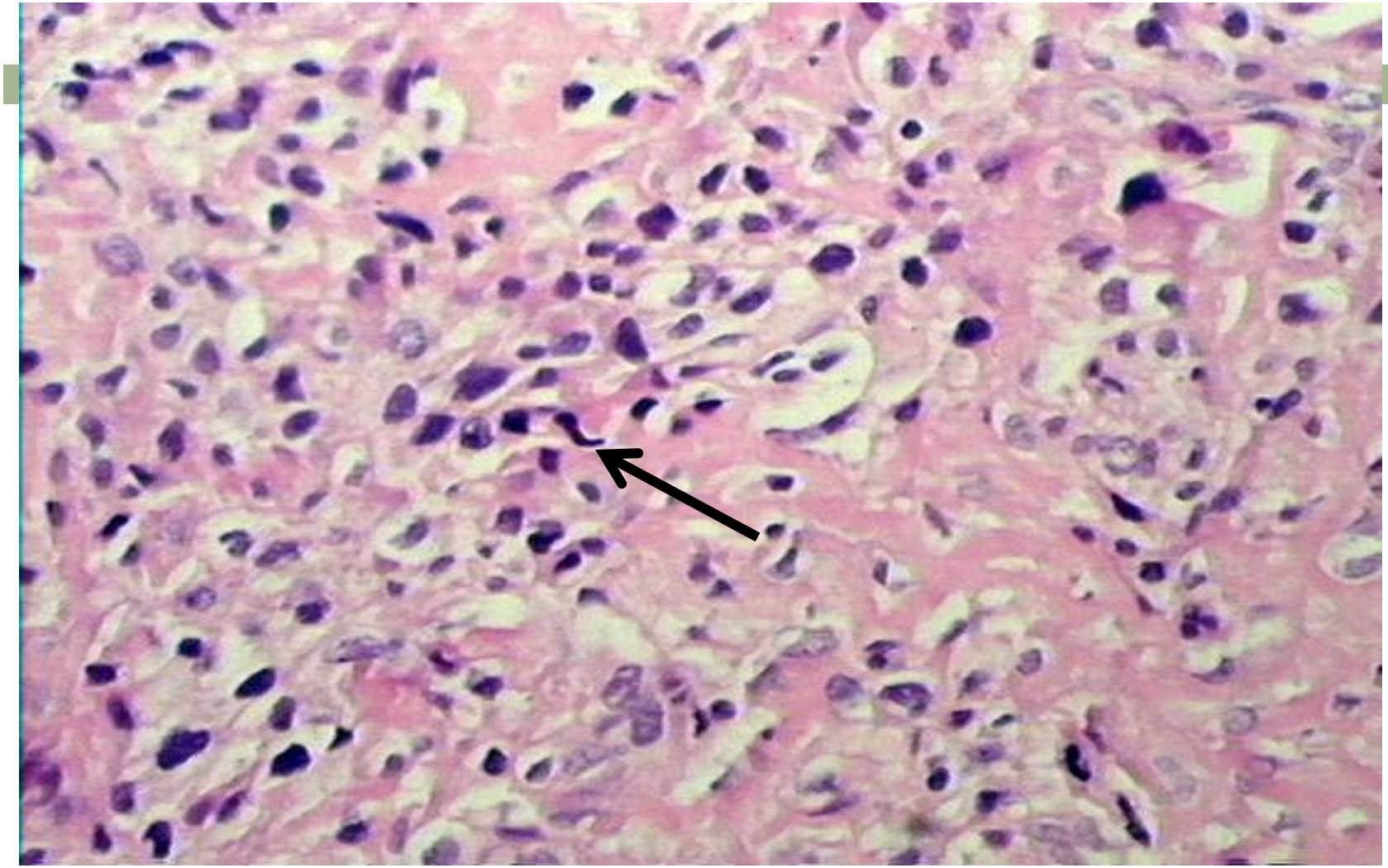
B: magnetic resonance scan of both legs shows soft tissue extent of the tumor (arrows).

- **2nd most common primary bone tumor**
- **Malignant tumor of mesenchymal origin**

Osteosarcoma of the upper end of the tibia.

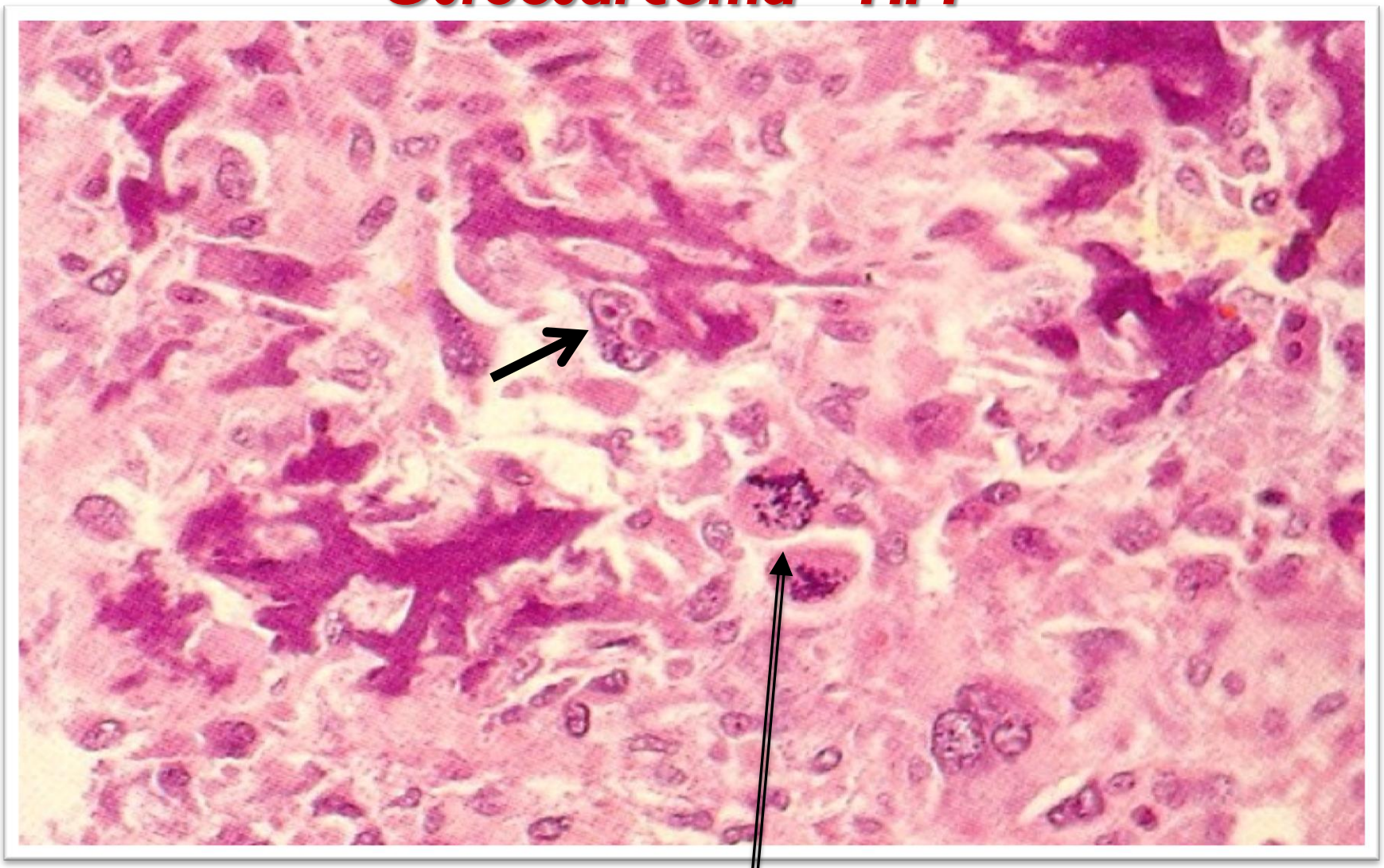
The tan-white tumor fills most of the medullary cavity of the metaphysis and proximal diaphysis. It has infiltrated through the cortex, lifted the periosteum, and formed soft tissue masses on both sides of the bone.

Osteosarcoma - LPF



Spindle shaped cells producing osteoid

Osteosarcoma - HPF



Malignant osteoid producing Spindle cells, giant cells,

Abnormal Mitosis

THE END